Workshop Manual

Audi 100 1991 ➤ , Audi 80 1992 ➤ ,
Audi A1 2011 ➤ , Audi A2 2001 ➤ ,
Audi A3 1997 ➤ , Audi A3 2004 ➤ ,
Audi A4 1995 ➤ , Audi A4 2001 ➤ ,
Audi A4 2008 ➤ ,
Audi A4 Cabriolet 2003 ➤ ,
Audi A5 Cabriolet 2009 ➤ ,
Audi A5 Coupé 2008 ➤ ,
Audi A5 Sportback 2010 ➤ ,
Audi A6 1995 ➤ , Audi A6 1998 ➤ ,
Audi A6 2005 ➤ , Audi A6 2011 ➤ ,
Audi A7 Sportback 2011 ➤ ,
Audi A8 1994 ➤ , Audi A8 2003 ➤ ,
Audi A8 2010 ➤ , Audi Cabriolet 1991 ➤ ,
Audi Q3 2012 ➤ , Audi Q5 2008 ➤ ,
Audi Q7 2007 ➤ , Audi R8 2007 ➤ ,
Audi TT 1999 ➤ , Audi TT 2007 ➤

Air conditioner with refrigerant R134a

Edition 08.2011

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List of Workshop Manual Repair GroupsList of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups

Repair Group

87 - Air conditioning system

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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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87 – Air conditioning system

1 Warning instructions when working on vehicles with high-voltage system

Hybrid vehicles

- ⇒ „1.1 Working on vehicles with high-voltage system (hybrid vehicles)“, page 1
- ⇒ „1.2 Visual inspection of high-voltage components and wiring for damage“, page 6

1.1 Working on vehicles with high-voltage system (hybrid vehicles)

WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

WARNING

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Working on vehicles with high-voltage wiring:

- *Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.*
- *High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.*
- *The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.*

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DANGER!

Risk of fatal injury if high-voltage components are damaged.

Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

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De-energising high-voltage system

DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be de-energised by a suitably qualified person (Audi high-voltage technician).*
- *It must be definitely confirmed that the high-voltage system is de-energised. The system may only be de-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The qualified person (Audi high-voltage technician) confirms that the system is de-energised and uses the locking cap -T40262- to ensure that the system cannot be re-energised. The ignition key and the maintenance connector for high-voltage system - TW - should then be stored in a safe place by the qualified person.*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

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Note

- *De-energising high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - De-energise high-voltage system (Rep. gr. 93)`

- The system must first be de-energised by a high-voltage technician before any work is done on the high-voltage system ⇒ Electrical system; Rep. gr. 93 ; De-energising high-voltage system .
- The types of work for which the high-voltage system has to be de-energised are indicated in the instructions for the procedure. For further information, see ⇒ Electrical system; Rep.

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gr. 93 ; General warning instructions for work on the high-voltage system .

Note

- *The high-voltage system must be de-energised prior to beginning certain work on components of hybrid vehicles that are connected to the high-voltage system (e.g. electrically driven air conditioner compressor).*
- *Work on the air conditioning system of hybrid vehicles that does not directly affect the high-voltage system (e.g. performing pressure test on refrigerant circuit, running Guided Fault Finding for air conditioner or control unit for air conditioning compressor -J842- etc.) must only be carried out by persons with basic electrical training ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system and ⇒ Vehicle diagnostic tester in „Guided Fault Finding" mode for air conditioner and battery power regulation .*
- *For certain work on hybrid vehicle components that are installed near high-voltage system components (e.g. battery cooling module, expansion valve to air conditioner on Audi Q5 etc.), the high-voltage system must be de-energised prior to beginning work ⇒ Electrical system; Rep. gr. 93 ; De-energising high-voltage system and ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific Workshop Manual).*

Re-energising high-voltage system

DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- ***Voltage levels in the high-voltage system constitute a safety hazard.***
- ***For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.***
- ***The high-voltage system may only be re-energised by a suitably qualified person (Audi high-voltage technician).***
- ***The system may only be re-energised using the vehicle diagnostic tester via „Guided Fault Finding".***
- ***The vehicle is then made ready for operation again by the qualified person (Audi high-voltage technician).***
- ***The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.***

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Note

- *Re-energise high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - Re-energise high-voltage system (Rep. gr. 93)`

Working with ignition switched on or high-voltage system active

DANGER!

When working on a vehicle with the ignition switched on or while the drive system is active, the engine can start unexpectedly and exhaust fumes can cause a health hazard in closed rooms. Moving parts can trap or draw in parts of the body and/or clothing (safety hazard).

Before switching on the ignition, perform the following steps:

- ***Move selector lever to position P***
- ***Activate parking brake***
- ***Switch off ignition***
- ***Open bonnet***
- ***Connect battery charger (e.g. -VAS 5095A-) to jump-start connections of 12 V electrical system***
- ***Switch on ignition***

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– To minimise the number of automatic engine starts when the vehicle's drive system is active during test and measurement work, charge the vehicle batteries e.g. with the battery charger 60A -VAS 5904- in battery standby mode ⇒ Electrical system; Rep. gr. 27 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

– For test and measurement work that requires the vehicle's drive system to be active or the ignition to be switched on, move the selector lever to position „P“, activate the parking brake and arrange the tools needed so that they cannot come into contact with moving components of the engine and so that they cannot even come near to components that turn when the engine is running.

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Note

- *Also move the selector lever to position „P“ and activate the parking brake before performing test and measurement work for which the ignition must be switched on but where the vehicle's drive system does not need to be active.*
- *The status of the drive system is shown by the control unit in dash panel insert -J285- via the „power meter“ ⇒ Owner's Manual .*
- *Activating and deactivating drive system ⇒ Owner's Manual (note display of control unit in dash panel insert -J285-).*

1.2 Visual inspection of high-voltage components and wiring for damage

WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

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WARNING

Working on vehicles with high-voltage wiring:

- *Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.*
- *High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.*
- *The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.*

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DANGER!

Risk of fatal injury if high-voltage components are damaged.

Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

Procedure: Performing visual inspection

- When performing the visual inspection of the engine compartment area, pay particular attention to the power and control electronics for electric drive, the high-voltage wiring for the battery and the air conditioner compressor and the high-voltage wiring for the electric drive motor.
- When performing a visual inspection of the the vehicle underbody, pay attention to the high-voltage wiring and the corresponding covers.
- When performing a visual inspection of the rear of the vehicle, pay attention to the hybrid battery, the high-voltage wiring for the battery and the electro-box with the maintenance connector.

Check the following when performing the visual inspection:

- There must be no external damage on any high-voltage components.
- The insulation of the high-voltage wiring must be intact and undamaged.
- Check for unusual deformations of the high-voltage wiring.
- If you notice anything unusual or if anything is unclear, ask a high-voltage technician or a specialist electrician.

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- For further information on the high-voltage system, refer to ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

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2 General information on air conditioning systems

2.1 General information

- Introduction ⇒ page 9
- Other reference material ⇒ page 11
- Principles of air conditioning systems ⇒ page 13
- Refrigerant R134a ⇒ page 16
- Properties of refrigerant R134a ⇒ page 17
- Refrigerant oil ⇒ page 19
- How air conditioning works ⇒ page 20
- General work safety ⇒ page 22
- Product properties ⇒ page 22
- Handling refrigerant ⇒ page 22
- Handling pressure vessels ⇒ page 23
- Safety regulations for working with extraction and charging systems ⇒ page 24
- Safety measures for working on vehicles with air conditioning system and for handling refrigerant R134a ⇒ page 24
- Basic rules for working on refrigerant circuit ⇒ page 29
- Before using air conditioner after system has been re-charged ⇒ page 38

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2.2 Introduction

This manual is intended to provide foremen and mechanics with the basic knowledge needed to ensure reliable and successful repairs.

Note

This requires careful study of the manual, coupled with suitable training on automotive air conditioning systems (with a qualification test if applicable) and the ability to apply the acquired expertise in practice.

This document is a compact reference work which should be kept at the workplace. It should also be available for presentation to the responsible supervisory agency on request.

Vehicles with high-voltage system (hybrid vehicles)

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

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WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

WARNING

Working on vehicles with high-voltage wiring:

- *Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.*
- *High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.*
- *The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.*

DANGER!

Risk of fatal injury if high-voltage components are damaged.

Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

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Vehicles with start/stop system

WARNING

Injury risk due to automatic engine start (vehicles with start/stop system).

- *On vehicles with an activated start/stop system (indicated by a message in the instrument cluster display), the engine may start automatically on demand.*
- *Therefore, please make sure that the start/stop system is deactivated when performing repair work on the vehicle (switch off the ignition, and switch it on again if required).*

All vehicles

Caution

Tools or materials (e.g. sealing additives) that have not been approved can damage or impair the system.

Use only tools and materials that have been approved by the manufacturer.

Warranty claims are not accepted if tools or materials that have not been approved are used.

2.3 Safety measures for vehicles with start/stop system

WARNING

Injury risk due to automatic engine start (vehicles with start/stop system).

- *On vehicles with an activated start/stop system (indicated by a message in the instrument cluster display), the engine may start automatically on demand.*
- *Therefore, please make sure that the start/stop system is deactivated when performing repair work on the vehicle (switch off the ignition, and switch it on again if required).*

2.4 Other reference material

- Workshop Manual for model-specific maintenance work ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (model-specific Workshop Manual) and ⇒ Current flow diagrams, Electrical fault finding and Fitting locations
- Technical Service Handbook (TPI) outlining action to be taken to rectify current problems
- Self-study programmes, e.g. ⇒ Self-study programme No. 208 ; Air conditioning systems in motor vehicles
- Video training courses for dealerships
- List of special tools and workshop equipment required for repairing the air conditioner ⇒ Catalogue of workshop equipment
- Service Organisation Handbook, Vol. 1 „Additional equipment“ ⇒ Audi ServiceNet, Handbooks

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- Workshop Manual: Air conditioner with refrigerant R12 (for vehicles built up to model year 1993; this Workshop Manual is available in hardcopy form only)

Vehicles with high-voltage system (hybrid vehicles)

For all work on vehicles with a high-voltage system, note the warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

WARNING

Working on vehicles with high-voltage wiring:

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DANGER!

Risk of fatal injury if high-voltage components are damaged.

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- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

2.5 Principles of air conditioning systems

- Physical principles ⇒ page 14
- Pressure and boiling point ⇒ page 14
- Vapour pressure table for refrigerant R134a ⇒ page 15
- Properties of refrigerant R134a ⇒ page 17

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2.5.1 Physical principles

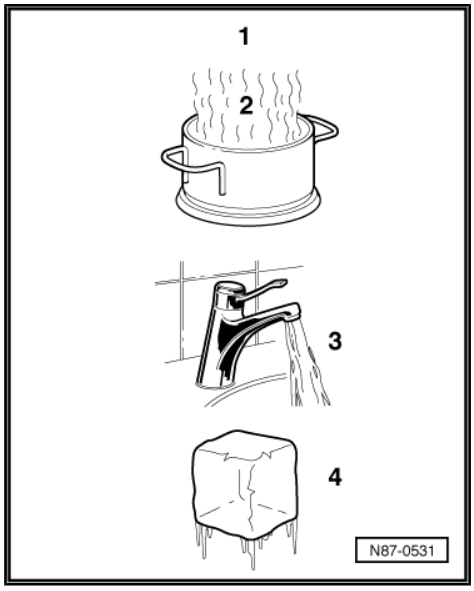
The four familiar states of water apply to air conditioning refrigerants, too.

1 - Gas (invisible)

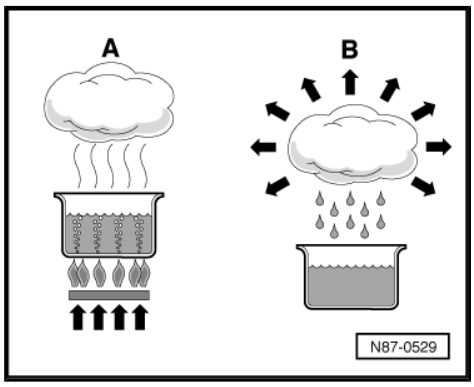
2 - Vapour

3 - Liquid

4 - Solid



When water is heated in a vessel (heat absorption), water vapour can be seen to rise. If the vapour is further heated through heat absorption, the visible vapour turns into invisible gas. The process is reversible. If heat is extracted from gaseous water -A-, it changes first to vapour -B-, then to water and finally to ice.



A - Heat absorption

B - Heat emission

Heat always flows from a warmer to a colder substance

Every substance consists of a mass of moving molecules. The fast-moving molecules of a warmer substance give off some of their energy to the cooler and thus slower molecules. As a result, the molecular motion of the warmer substance slows down and that of the colder substance is accelerated. This process continues until the molecules of both substances are moving at the same speed. They are then at the same temperature and no further heat exchange takes place.

2.5.2 Pressure and boiling point

The boiling point given in tables for a liquid is always referenced to an atmospheric pressure of 1 bar. If the pressure acting on a liquid changes, its boiling point also changes.

Note

Pressure can be measured in various units: 1 MPa (megapascal) is equivalent to 10 bar gauge pressure, or 145 psi; 1 bar absolute pressure is the same as 0 bar gauge pressure, which is roughly equivalent to atmospheric pressure.

For example, water boils at a lower temperature the lower the pressure.

The vapour pressure curves for water and refrigerant R134a show, for example, that, at constant pressure, reducing the temperature changes vapour to liquid (in the condenser) or that, for instance, reducing the pressure causes the refrigerant to change from liquid to vapour (in the evaporator).

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Vapour pressure curve for water

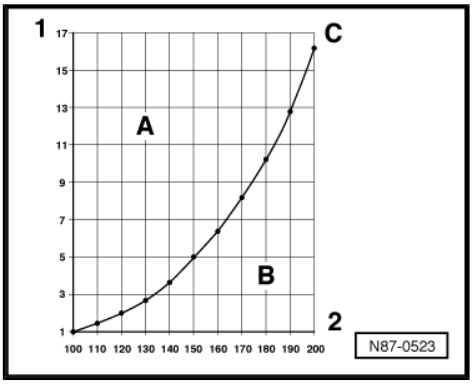
A - Liquid

B - Gaseous

C - Vapour pressure curve for water

1 - Pressure acting on liquid in bar (absolute)

2 - Temperature in °C



Vapour pressure curve for refrigerant R134a

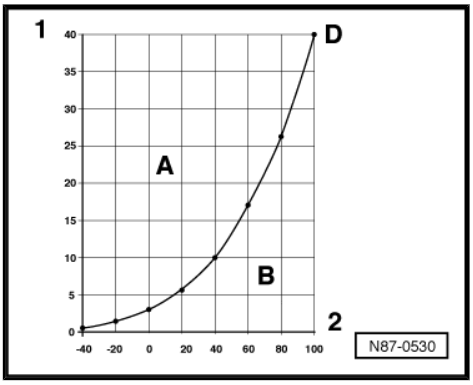
A - Liquid

B - Gaseous

D - Vapour pressure curve for refrigerant R134a

1 - Pressure acting on liquid in bar (absolute)

2 - Temperature in °C



2.5.3 Vapour pressure table for refrigerant R134a

The vapour pressure table for every refrigerant is published in the literature for refrigeration system engineers. This table makes it possible to determine the vapour pressure acting on the column of liquid in a vessel if the temperature of the vessel is known.

As there is a characteristic vapour pressure table for every refrigerant, it is possible to identify the type of refrigerant by measuring pressure and temperature.

Note

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- *„0 bar absolute pressure“ corresponds to an absolute vacuum. The normal ambient pressure (atmospheric pressure) corresponds to „1 bar absolute pressure“. On the scales of most pressure gauges, „0 bar“ corresponds to an absolute pressure of 1 bar (this is also indicated by the value „-1“ appearing below „0“).*
- *Pressure can be measured in various units: 1 MPa (megapascal) is equivalent to 10 bar gauge pressure, or 145 psi; 1 bar absolute pressure is the same as 0 bar gauge pressure, which is roughly equivalent to atmospheric pressure.*

Temperature in °C	Pressure in bar (gauge pressure), R134a
-45	-0.61
-40	-0.49
-35	-0.34
-30	-0.16
-25	0.06
-20	0.32

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Temperature in °C	Pressure in bar (gauge pressure), R134a
-15	0.63
-10	1.00
-5	1.43
0	1.92
5	2.49
10	3.13
15	3.90
20	4.70
25	5.63
30	6.70
35	7.83
40	9.10
45	10.54
50	12.11
55	13.83
60	15.72
65	17.79
70	20.05
75	22.52
80	25.21
85	28.14
90	31.34

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2.6 Refrigerant R134a

Air conditioning systems in vehicles use a vaporisation and condensation process. These systems employ a substance with a low boiling point, referred to as refrigerant.

The refrigerant used is tetrafluoroethane or R134a, which boils at -26.5°C at a vapour pressure of 1 bar.

- Physical properties of refrigerant R134a ⇒ page 16
- Critical point ⇒ page 16
- Environmental aspects of refrigerant R134a ⇒ page 17

2.6.1 Physical properties of refrigerant R134a

Chemical formula	CH2F–CF3 or CF3–CH2F
Chemical designation	Tetrafluoroethane
Boiling point at 1 bar	-26.5 °C
Solidification point	-101.6 °C
Critical temperature	100.6 °C
Critical pressure	40.56 bar (absolute)

2.6.2 Critical point

The critical point (critical temperature and critical pressure) is the point above which there is no longer a boundary between liquid and gas.

A substance above its critical point is always in the gaseous state.

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At temperatures below the critical point, all types of refrigerant in pressure vessels exhibit both a liquid and a gas phase, i.e. there is a layer of gas above the liquid.

As long as both liquid and gas are present in the vessel, the pressure is governed by ambient temperature ⇒ page 15 „Vapour pressure table“.

Note

Different types of refrigerant must never be mixed. The refrigerant specified for the respective air conditioning system must be used exclusively.

2.6.3 Environmental aspects of refrigerant R134a

- R134a is a fluorocarbon and contains no chlorine.
- R134a has a shorter atmospheric lifespan than refrigerant R12.
- R134a does not damage the ozone layer, the ozone depletion potential is zero.
- The global warming potential (GWP) of R134a is 1300 (the GWP of carbon dioxide = 1).
- The global warming effect of R134a is ten times less than that of refrigerant R12.

2.7 Properties of refrigerant R134a

- Trade names and designations ⇒ page 17
- Colour ⇒ page 18
- Vapour pressure ⇒ page 18
- Physical properties of R134a ⇒ page 18
- Reaction with metals ⇒ page 18
- Critical temperature/critical pressure ⇒ page 18
- Water content ⇒ page 18
- Combustibility ⇒ page 19
- Charge factor ⇒ page 19
- Tracing leaks ⇒ page 19

2.7.1 Trade names and designations

The refrigerant R134a is currently available under the following trade names:

- H-FKW 134a
- SUVA 134a
- KLEA 134a

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Note

- *Different trade names may be used in other countries.*
- *Of the wide range of refrigerants available, this is the only one which may be used for vehicles. The designations Frigen and Freon are trade names. They also apply to refrigerants which should not be used in vehicles.*

2.7.2 Colour

Like water, refrigerants are colourless in both vapour and liquid form. Gas is invisible. Only the boundary layer between gas and liquid is visible (liquid level in indicator tube of charging cylinder or bubbles in sight glass). Liquid refrigerant R134a may have a coloured (milky) appearance in a sight glass. This cloudiness is caused by partially dissolved refrigerant oil and does not indicate a fault.

2.7.3 Vapour pressure

In a partially filled, closed vessel, the quantity of refrigerant evaporating from the surface equals the quantity returning to the liquid state as vapour particles condense. This state of equilibrium occurs under the influence of pressure and is often called vapour pressure. Vapour pressure is dependent on temperature
⇒ page 15 „Vapour pressure table“

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2.7.4 Physical properties of R134a

As the vapour pressure curves of R134a and other refrigerants are often very similar, unequivocal identification cannot be made simply on the basis of pressure.

When using R134a, the air conditioner compressor is lubricated by means of special synthetic refrigerant oils, e.g. PAG oils (polyalkylene glycol oils).

2.7.5 Reaction with metals

In its pure state, refrigerant R134a is chemically stable and does not corrode iron or aluminium.

However, contamination of the refrigerant, e.g. with chlorine compounds, leads to the corrosion of certain metals and plastics. This can result in blockage, leaks or deposits at the air conditioner compressor piston.

2.7.6 Critical temperature/critical pressure

The refrigerant R134a remains chemically stable up to a gas pressure of 39.5 bar (corresponding to a temperature of 101 °C). Above this temperature, the refrigerant decomposes (refer to "Combustibility").

2.7.7 Water content

Only very small amounts of water are soluble in liquid refrigerant. On the other hand, refrigerant vapour and water vapour mix in any ratio.

Any water in the refrigerant circuit will be entrained in droplet form once the dryer in the receiver or reservoir has absorbed as little as approx. 7 g of water. This water flows as far as the expansion valve nozzle or the restrictor and turns to ice. The air conditioner will then no longer provide any cooling effect.

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Water causes irreparable damage to the air conditioner because at high pressures and temperatures it combines with other impurities to form acids.

2.7.8 Combustibility

Refrigerant is non-flammable. In fact it has a fire-inhibiting or fire-extinguishing effect. Refrigerant decomposes when exposed to flames or red-hot surfaces. UV light (produced for example during electric welding) also causes refrigerant decomposition. The resultant decomposition products are toxic and must not be inhaled. However, these chemicals irritate the mucous membranes, giving adequate warning of their presence.

2.7.9 Charge factor

A vessel must have space for vapour as well as liquid. As the temperature rises, the liquid expands. The vapour-filled space becomes smaller. At a certain point, there will only be liquid in the vessel. Beyond this, even a slight increase in temperature causes great pressure to build up in the vessel as the liquid attempts to continue expanding despite the absence of the necessary space. The resultant forces are sufficient to rupture the vessel. To stop vessels being overfilled, regulations governing the storage of compressed gases specify the number of kilograms of refrigerant with which a vessel may be filled per litre of internal vessel volume. The maximum permissible capacity is calculated by multiplying this "charge factor" by the internal volume of the vessel. The figure for the refrigerant used in motor vehicles is 1.15 kg/litre.

2.7.10 Tracing leaks

External damage, for example, can cause a leak in the refrigerant circuit. The small quantity of refrigerant escaping from minor leaks can be detected for example using an electronic leak detector or by adding a UV leak detection additive to the refrigerant circuit. Electronic leak detectors are capable of registering leaks with refrigerant losses of less than 5 g per year.

Note

Use must be made for the various refrigerants of leak detectors designed for the composition of the refrigerant concerned. For example, a leak detector for R12 refrigerant is not appropriate for R134a, as R134a refrigerant has no chlorine atoms and the leak detector therefore does not respond.

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2.8 Refrigerant oil

Caution

- *For handling of refrigerant oil, refer to ⇒ Audi-ServiceNet, HSO Environmental Protection (or ⇒ Volkswagen-ServiceNet, Handbooks, Service Handbook; Environmental Protection; Immission Protection).*

Refrigerant oil mixes with the refrigerant (in a ratio of about 20 - 40 %, depending on compressor type and quantity of refrigerant) and circulates constantly in the system, lubricating the moving parts.

Special synthetic refrigerant oils, e.g. polyalkylene glycol (PAG) oil, are used in conjunction with R134a air conditioning systems. This is necessary as mineral oil, for example, does not mix with R134a. In addition, the materials of the R134a air conditioning system could be corroded as a result of mixture flowing through

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the refrigerant circuit under pressure at high temperatures or breakdown of the lubricating film in the air conditioner compressor. The use of non-approved oils can lead to the failure of the air conditioning system; exclusive use is therefore to be made of authorised oils.

⇒ Electronic parts catalogue

Type of oil for R134a in motor vehicles: PAG (polyalkylene-glycol)

Note

- *Do not store refrigerant oils in open containers as they are extremely hygroscopic (water-absorbing).*
- *Always keep oil container sealed.*
- *Do not re-use old refrigerant oil. It must be disposed of as used oil of unknown origin ⇒ Audi-ServiceNet, HSO Environmental Protection (or ⇒ Volkswagen-ServiceNet, Handbooks, Service Handbook; Environmental Protection; Immission Protection).*
- *Ester-based oils are only intended for use with large systems (not for motor vehicle air conditioners).*

- Properties of refrigerant oil ⇒ page 20

2.8.1 Properties of refrigerant oil

The most important properties are a high degree of solubility with refrigerant, good lubricity, absence of acid and minimal water content. It is therefore only permissible to use certain specified oils. For a list of approved refrigerant oils and capacities, refer to ⇒ page 288 .

PAG oils, which are appropriate for refrigerant R134a, are highly hygroscopic and do not mix with other oils. Opened containers should therefore be closed again immediately to prevent ingress of moisture. Moisture and acids promote the ageing of refrigerant oil, causing it to become dark, viscous and corrosive towards metals.

Note

- *On account of its chemical properties, the refrigerant oil is not to be disposed of together with engine or gear oil. Refrigerant oil must be disposed of as used oil of unknown origin ⇒ Audi-ServiceNet, HSO Environmental Protection (or ⇒ Volkswagen-ServiceNet, Handbooks, Service Handbook; Environmental Protection; Immission Protection).*
- *Only oil approved for the air conditioner compressor is to be used for refrigerant circuits containing refrigerant R134a ⇒ Electronic parts catalogue and capacities ⇒ page 288.*

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2.9 How air conditioning works

The temperature in the passenger compartment depends on the amount of heat radiated into the vehicle through the windows and conducted by the metal parts of the body. In hot weather some of the heat must be pumped off to achieve a more comfortable temperature for the occupants.

As heat is always transmitted away from warmer areas and into cooler areas, the passenger compartment is fitted with a unit for generating low temperatures in which refrigerant is constantly

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evaporated. The heat required for this is extracted from the air flowing through the evaporator.

After absorbing heat, the refrigerant is pumped off through the air conditioner compressor. The work of compression of the air conditioner compressor increases the heat content and temperature of the refrigerant. Its temperature is then substantially higher than that of the surrounding air.

The hot refrigerant flows with its heat content to the condenser. where the refrigerant dissipates its heat to the surrounding air via the condenser due to the temperature gradient between the refrigerant and the surrounding air.

The refrigerant thus acts as a heat transfer medium. As it is reused, the refrigerant is returned to the evaporator.

For this reason all air conditioning systems are based on the refrigerant circulation principle. There are however differences as regards the units used.

- Comfort of vehicle occupants ⇒ page 21
- Environmental aspects ⇒ page 21

2.9.1 Comfort of vehicle occupants

A basic requirement for concentration and safe driving is a feeling of comfort in the passenger compartment. Especially when conditions are hot and humid, a good level of comfort can only be achieved with air conditioning. Passenger comfort can of course also be improved by opening the windows or sun roof, or by increasing the air delivery. This, however, involves several drawbacks for the occupants, e.g. more noise, draughts, exhaust fumes and unfiltered pollen (unpleasant for allergy sufferers).

Climate control together with a good heating and ventilation system can create a sense of well being and comfort by regulating temperature, humidity and air circulation in the passenger compartment to suit ambient conditions, both when the vehicle is stationary and when it is moving.

Other important advantages of air conditioning:

- Purification of the air supplied to the passenger compartment (dust and pollen, for example, are washed out by the moist fins of the evaporator and removed with the condensate).
- Pleasant temperature levels (example: mid-size car after short travelling time, ambient temperature 30 °C in the shade and vehicle exposed to sunlight)

	With air conditioning	Without air conditioning
At head height	23 °C	42 °C
At chest level	24 °C	40 °C
In footwell	30 °C	35 °C

2.9.2 Environmental aspects

Since about 1992, the air conditioning systems of newly manufactured cars have been successively changed to refrigerant R134a. This refrigerant contains no chlorine and therefore does not deplete the ozone layer.

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Up until roughly 1992, refrigerant R12 was used for air conditioning systems. Due to its chlorine atoms, this CFC had a high ozone depletion potential as well as potential for intensifying the greenhouse effect.

Conversion programmes are available for old existing systems filled with the ozone-depleting substance R12 ⇒ Workshop Man-

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ual for air conditioners with refrigerant R12 (this Workshop Manual is available in hardcopy form only).

For environmental reasons, refrigerants must not be released into the atmosphere ⇒ page 83 (see the relevant environmental legislation).

2.10 General work safety

- In accordance with regulations of the German industrial liability insurance association, VBG 20, (other regulations may apply in other countries)
- Observe specific instructions relating to workplaces where refrigerants are handled ⇒ Audi-ServiceNet, HSO Environmental Protection . These instructions must be posted at the workplace.

2.11 Product properties

Refrigerants used in motor vehicle air conditioning systems belong to the new generation of refrigerants based on chlorine-free, partially fluorinated hydrocarbons (H-FKW, R134a; other names may be used in other countries).

With regard to their physical properties, these are refrigerants which have been liquefied under pressure. They are subject to the regulations governing pressure vessels and may only be used in approved and appropriately marked containers.

Specific requirements must be observed to ensure safe and proper handling:

2.12 Handling refrigerant

If refrigerant vessels are opened, the contents may escape in liquid or vapour form. The higher the pressure in the vessel, the more vigorous the process.

The pressure level is governed by two factors:

- The type of refrigerant in the vessel. „Rule: The lower the boiling point, the higher the pressure.“
- The temperature level. „Rule: The higher the temperature, the higher the pressure.“

WARNING

- *There is a risk of icing-up.*
- *The refrigerant may emerge in liquid or vapour form.*
- *Do not open vessels containing refrigerant.*

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Wear safety goggles

Put on safety goggles to prevent refrigerant getting into the eyes, as this could cause severe injury through frostbite.

Wear protective gloves and apron

Grease and oils dissolve readily in refrigerants. They would therefore damage the protective layer of grease if allowed to come into contact with the skin. Degreased skin is however sensitive to the cold and germs.

Do not allow liquid refrigerant to come into contact with the skin

The refrigerant draws heat for evaporation from the surrounding area - even if this is the skin. This may give rise to extremely low

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temperatures and result in local frostbite (boiling point of R134a: -26.5 °C at ambient pressure).

Do not inhale refrigerant vapours

If refrigerant vapour escapes in concentrated form, it mixes with the surrounding air and displaces the oxygen necessary for breathing.

Smoking is absolutely prohibited

A burning cigarette can cause refrigerant to decompose. The resultant substances are toxic and must not be inhaled.

Welding and soldering on refrigeration systems

Before performing welding, brazing or soldering work on vehicles in the vicinity of air conditioning system components, extract refrigerant and remove any remaining refrigerant by blowing out with nitrogen.

The products of refrigerant decomposition due to the effect of heat are not only toxic, but may also have a highly corrosive effect on pipes and system components. The principal substance is hydrogen fluoride.

Pungent odour

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A pungent odour indicates that the products of decomposition mentioned above have already formed. Avoid inhaling these substances under all circumstances, as otherwise the airways, lungs and other organs could be damaged.

First aid

- Following accidental contact with eyes or mucous membranes, immediately rinse with copious amounts of running water and consult an eye specialist.
- Following accidental contact with the skin, immediately remove clothing affected and rinse skin with copious amounts of water.
- Following accidental inhalation of concentrated refrigerant vapours, the person concerned must be taken immediately into the open air. Call a doctor. Administer oxygen in the event of breathing difficulties. If the person affected is having great difficulty breathing or is not breathing at all, tilt back head and administer artificial respiration.

◆ Handling pressure vessels ⇒ page 23

2.13 Handling pressure vessels

Secure vessels to prevent them falling over.

Secure upright cylinders to stop them falling over and cylinders lying flat to stop them rolling away.

Pressure vessels must never be thrown.

If dropped, the vessels could be so severely deformed that they rupture. The refrigerant evaporates immediately, liberating considerable force. Flying fragments of cylinders can cause severe injuries.

To protect the valves, cylinders may only be transported with the protective cap screwed on.

Valves may break off if cylinders are not properly transported.

Never store in the vicinity of radiators.

High temperatures may occur in such areas. High temperatures are also accompanied by high pressures and the maximum permissible vessel pressure may be exceeded.

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Never heat to above 50 °C

To avoid possible risk, pressure vessel regulations specify that vessels are not to be heated to in excess of 50 °C.

Do not heat in an uncontrolled manner

Do NOT heat with a naked flame. Local overheating can cause structural changes in the material of the vessel, which then reduce its ability to withstand pressure. There is also a danger of refrigerant decomposition due to localised overheating.

Sealing empty vessels

Empty refrigerant vessels must always be sealed to prevent the ingress of moisture. Moisture causes steel containers to rust. This weakens the vessel walls. In addition, any rust particles which enter refrigeration systems from storage vessels will cause malfunctioning.

2.14 Safety regulations for working with extraction and charging systems

- Before connecting the charging system to the air conditioning system, ensure that the shut-off valves are closed.
- Before disconnecting the charging system from the air conditioning system, make sure the charging process has been completed to prevent refrigerant escaping into the atmosphere.
- Once the purified refrigerant from the charging system has been transferred to an external compressed-gas cylinder, close the hand shut-off valves at the cylinder and charging system.
- Do not expose the charging system to moisture or use it in a wet environment.
- Disconnect from power supply before performing service work on the charging system.
- An extension cable should not normally be used because it can increase the fire hazard. If the use of an extension cable is unavoidable, the minimum cross-section should be 2.5 mm^2.
- In case of fire, remove external cylinder.
- Entrained oil from the air conditioning system drawn off by the suction unit into the measurement vessel supplied is subsequently to be transferred to a sealable container, as it contains a small quantity of refrigerant which must not be released into the environment.
- Following shutdown, the air conditioner service station must be secured to stop it rolling away.

2.15 Safety measures for working on vehicles with air conditioning system and for handling refrigerant R134a

Vehicles with high-voltage system (hybrid vehicles)

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

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WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

WARNING

Working on vehicles with high-voltage wiring:

- *Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.*
- *High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.*
- *The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.*

DANGER!

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Risk of fatal injury if high-voltage components are damaged.

Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

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Vehicles with start/stop system

WARNING

Injury risk due to automatic engine start (vehicles with start/stop system).

- *On vehicles with an activated start/stop system (indicated by a message in the instrument cluster display), the engine may start automatically on demand.*
- *Therefore, please make sure that the start/stop system is deactivated when performing repair work on the vehicle (switch off the ignition, and switch it on again if required).*

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All vehicles

WARNING

Danger of asphyxiation, frostbite and poisoning from escaping refrigerant

Risk of injury from escaping refrigerant

- *Danger of asphyxiation from displacement of ambient air*
- *Danger of frostbite (or risk of cryogenic burns caused by the evaporation of liquid refrigerant)*
- *Danger of poisoning from decomposition products*

Remedy

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- *Work may only be performed on the refrigerant circuit of an air conditioning system in well ventilated areas.*
- *Ensure good ventilation when handling refrigerant and working on the refrigerant circuit (exchange of air at least 1 once per hour in workshops and 3 times per hour in low-level areas (e.g. inspection pits). Workshop exhaust gas extraction systems are to be switched on.*
- *Vessels and devices containing refrigerant are only to be stored in well ventilated areas (e.g. not in cellars or in the vicinity of cellar entrances)*
- *Never inhale refrigerant vapours emerging*
- *Wear suitable protective gloves and safety goggles when handling refrigerant and working on the refrigerant circuit*
- *It is advisable to keep an eye bath to hand.*
- *Work may only be performed on the refrigerant circuit of an air conditioning system in well ventilated areas. Switch on workshop extraction systems, if available.*
- *Refrigerant must not be stored in low-level areas (e.g. cellars) and their exits or light wells.*

First Aid

- *Following inhalation of highly concentrated refrigerant vapours, the person concerned is to be removed immediately from the hazard area and laid down in the open air. Keep the person concerned warm and calm. Perform artificial respiration in the event of breathing difficulties (administer oxygen if necessary). If the person affected is having great difficulty breathing or is not breathing at all, tilt back head and administer artificial respiration. Consult a doctor.*
- *Should liquid refrigerant come into contact with the eyes, rinse them thoroughly with water for about 15 minutes. Then administer eye drops and consult a doctor immediately even if no pain is felt.*
- *Never attempt to administer liquids through the mouth of an unconscious person. Consult a doctor if the symptoms persist and in cases of doubt*
- *The doctor must be informed that the frostbite was caused by refrigerant R 134a. Should refrigerant come into contact with other parts of the body despite compliance with the safety regulations, these must likewise be rinsed immediately for approximately 15 minutes with cold or luke warm water.*
- *Following accidental contact with eyes or mucous membranes, immediately rinse with copious amounts of running water and consult an eye specialist.*
- *In the event of skin contact, immediately remove wet clothing and rinse the areas of skin affected with a copious amount of cold or luke warm water (never use hot water). Consult a doctor in the event of frostbite.*

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Note

- *The refrigerant has a scarcely perceptible odour and is thus not noticeable.*
- *The refrigerant gas is heavier than air and accumulates in low-level areas such as inspection pits, cellars and hollows, where it displaces the ambient air and thus the oxygen. A lack of oxygen in the atmosphere is potentially fatal.*
- *Liquid refrigerant escaping from a leak for example evaporates at an ambient pressure of approx. 1 bar at around -29.4 °C. If the refrigerant evaporates on the skin, it will cause frostbite or cryogenic burns. Sensitive parts of the body such as the cornea of the eye are particularly at risk. Large-scale cryogenic burns are potentially fatal.*
- *The refrigerant decomponses on coming into contact with a flame or a hot surface. Danger of poisoning on inhaling toxic decomposition products. A pungent odour indicates that products of decomposition have already developed. Avoid inhaling these substances under all circumstances, as otherwise the airways, lungs and other organs could be damaged.*
- *The specific hazards associated with refrigerant and the substance data etc. can be found in the safety data sheets.*

- Welding, brazing and soldering work must not be performed on components of air conditioning system when charged. This also applies to welding and soldering work on the vehicle if there is a danger of air conditioner components becoming hot. When performing paintwork repairs, the temperature in the drying booth or preheating zone must not exceed 80 °C.

Reason:

Exposure to heat generates considerable pressure in the system, which could cause the high-pressure safety valve to open.

Remedy:

– Discharge refrigerant circuit using air conditioner service station.

Note

Damaged or leaking components of the air conditioning system must not be repaired by welding or soldering. They must always be renewed.

Refrigerant vessels (e.g. charging cylinders of air conditioner service station) must never be subjected to excessive heat or exposed to direct sunlight.

Remedy:

– Vessels must never be completely filled with liquid refrigerant. Without sufficient room for expansion (gas cushion), vessels will rupture with explosive effect in the event of an increase in temperature ⇒ page 17 .

Refrigerant should never be poured into systems or vessels containing any air.

Remedy:

– Evacuate systems and containers before charging with refrigerant.

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2.16 Basic rules for working on refrigerant circuit

Vehicles with high-voltage system (hybrid vehicles)

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

WARNING

Working on vehicles with high-voltage wiring:

- *Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.*
- *High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.*
- *The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.*

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DANGER!

Risk of fatal injury if high-voltage components are damaged.

Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

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If work is necessary in the vicinity of high-voltage system components, perform a visual inspection of the high-voltage components and wiring to check for damage ⇒ page 6 and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

If work is necessary on high-voltage system components, de-energise the high-voltage system ⇒ Electrical system; Rep. gr. 93 ; De-energising high-voltage system and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

De-energising high-voltage system

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DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be de-energised by a suitably qualified person (Audi high-voltage technician).*
- *It must be definitely confirmed that the high-voltage system is de-energised. The system may only be de-energised using the vehicle diagnostic tester via „Guided Fault Finding“.*
- *The qualified person (Audi high-voltage technician) confirms that the system is de-energised and uses the locking cap -T40262- to ensure that the system cannot be re-energised. The ignition key and the maintenance connector for high-voltage system - TW - should then be stored in a safe place by the qualified person.*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

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Note

- *De-energising high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - De-energise high-voltage system (Rep. gr. 93)`

Re-energising high-voltage system

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- *The high-voltage system may only be re-energised by a suitably qualified person (Audi high-voltage technician).*
- *The system may only be re-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The vehicle is then made ready for operation again by the qualified person (Audi high-voltage technician).*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

Note

- *Re-energise high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
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Vehicles with start/stop system

WARNING

Injury risk due to automatic engine start (vehicles with start/stop system).

- *On vehicles with an activated start/stop system (indicated by a message in the instrument cluster display), the engine may start automatically on demand.*
- *Therefore, please make sure that the start/stop system is deactivated when performing repair work on the vehicle (switch off the ignition, and switch it on again if required).*

All vehicles

- General notes ⇒ page 33
- Cleaning refrigerant circuit ⇒ page 33
- Additionally for vehicles with air conditioner compressor with no magnetic clutch (with air conditioner compressor regulating valve -N280-) ⇒ page 34
- O-rings ⇒ page 38

2.16.1 General notes

- Observe specific instructions relating to workplaces ⇒ Audi ServiceNet, HSO Environmental Protection .
- Ensure absolute cleanliness when working.
- Wear safety goggles and gloves when working with refrigerant and nitrogen.
- Switch on workshop extraction systems, if available.
- Always use air conditioner service station to discharge refrigerant circuit, then unfasten screw connections and renew defective components.
- Use caps to seal off opened assemblies and hoses to prevent the ingress of moisture and dirt.
- Use only tools and materials intended for refrigerant R134a.
- Seal opened refrigerant oil containers to protect against moisture.

Note

- *After completing service work, screw sealing caps (with seals) onto all connections with valves and service connections.*
- *Before starting up air conditioning system, check specified capacity for vehicle ⇒ page 265 .*
- *Do not top up refrigerant in circuit; discharge existing refrigerant and re-charge system.*

2.16.2 Cleaning refrigerant circuit

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The refrigerant circuit must be flushed out with refrigerant R134a ⇒ page 115 (or blown out with compressed air and nitrogen ⇒ page 106) in the following cases:

– If moisture or dirt has entered the refrigerant circuit (e.g. following an accident)
– If the refrigerant oil is dark and viscous
– If there is too much refrigerant oil in the refrigerant circuit after renewing compressor
– If the air conditioner compressor has to be renewed due to „internal“ damage (e.g. noise or no output)

Note

When blowing out components with compressed air and nitrogen, always extract the gas mixture escaping from the components with suitable extraction units (workshop extraction system).

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2.16.3 Additionally for vehicles with air conditioner compressor with no magnetic clutch (with air conditioner compressor regulating valve -N280- only)

- The engine is only to be started following complete assembly of the refrigerant circuit (constant air conditioner compressor operation).
- If the engine has to be operated with the refrigerant circuit empty, only do so for as long as absolutely essential and avoid increased engine speeds.

2.16.4 Additional information on vehicles with high-voltage system

Hybrid vehicles

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

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WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

WARNING

Working on vehicles with high-voltage wiring:

- *Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.*
- *High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.*
- *The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.*

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DANGER!

Risk of fatal injury if high-voltage components are damaged.

Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

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If work is necessary in the vicinity of high-voltage system components, perform a visual inspection of the high-voltage components and wiring to check for damage ⇒ page 6 and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

If work is necessary on high-voltage system components, de-energise the high-voltage system ⇒ Electrical system; Rep. gr. 93 ; De-energising high-voltage system and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

De-energising high-voltage system

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DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be de-energised by a suitably qualified person (Audi high-voltage technician).*
- *It must be definitely confirmed that the high-voltage system is de-energised. The system may only be de-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The qualified person (Audi high-voltage technician) confirms that the system is de-energised and uses the locking cap -T40262- to ensure that the system cannot be re-energised. The ignition key and the maintenance connector for high-voltage system - TW - should then be stored in a safe place by the qualified person.*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

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Note

- *De-energising high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - De-energise high-voltage system (Rep. gr. 93)`

Re-energising high-voltage system

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- *The high-voltage system may only be re-energised by a suitably qualified person (Audi high-voltage technician).*
- *The system may only be re-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The vehicle is then made ready for operation again by the qualified person (Audi high-voltage technician).*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

Note

- *Re-energise high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
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- The engine should only be started after the refrigerant circuit has been assembled completely.
- On vehicles with battery cooling, hybrid operation is only possible with the air conditioner charged and with no air conditioner faults stored ⇒ Vehicle diagnostic tester, „Guided Fault Finding" function for air conditioner and battery regulation
- After installing the air conditioner compressor and then filling the refrigerant circuit, first start up the electrically driven air conditioner compressor by way of the „Compressor run-in" function of the basic setting routine. Otherwise, the air conditioner compressor may be damaged if refrigeration oil has accumulated in the compression chamber of the air conditioner compressor on account of inappropriate storage prior to installation. ⇒ Vehicle diagnostic tester in „Guided Fault Finding" mode for air conditioner and battery power regulation

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- Electrically driven air conditioner compressors are only to be actuated with the refrigerant circuit charged. The air conditioner compressor may be damaged if the air conditioner compressor runs with the refrigerant circuit empty. ⇒ Vehicle diagnostic tester in „Guided Fault Finding“ mode for air conditioner and battery power regulation

DANGER!

When working on a vehicle with the ignition switched on or while the drive system is active, the engine can start unexpectedly and exhaust fumes can cause a health hazard in closed rooms. Moving parts can trap or draw in parts of the body and/or clothing (safety hazard).

Before switching on the ignition, perform the following steps:

- ***Move selector lever to position P***
- ***Activate parking brake***
- ***Switch off ignition***
- ***Open bonnet***
- ***Connect battery charger (e.g. -VAS 5095A-) to jump-start connections of 12 V electrical system***
- ***Switch on ignition***

– To minimise the number of automatic engine starts when the vehicle's drive system is active during test and measurement work, charge the vehicle batteries e.g. with the battery charger 60A -VAS 5904- in battery standby mode ⇒ Electrical system; Rep. gr. 27 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

– For test and measurement work that requires the vehicle's drive system to be active or the ignition to be switched on, move the selector lever to position „P“, activate the parking brake and arrange the tools needed so that they cannot come into contact with moving components of the engine and so that they cannot even come near to components that turn when the engine is running.

2.16.5 O-rings

- Use only seals which are resistant to refrigerant R134a and the corresponding refrigerant oils. Colour coding of O-ring seals is no longer employed. Black and coloured O-rings are used.
- Pay attention to the correct inside diameter of the seals used ⇒ Electronic parts catalogue , ⇒ Heating, air conditioning; Rep. gr. 87 and / or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).
- Seals may only be used once.
- Before fitting, moisten seals slightly with refrigerant oil (PAG oil).

2.17 Before using air conditioner after system has been re-charged

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Mechanically driven air conditioner compressor

– Give the air conditioner compressor approx. 10 turns by hand by way of the magnetic clutch plate or the pulley.

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– Start the engine with the air conditioning system switched off (air conditioning system magnetic clutch -N25- and air conditioner compressor regulating valve -N280- are not actuated).
– Switch on the air conditioner compressor once the idling speed has stabilised and run it for at least 10 minutes at idle in the maximum cooling output setting.

Electrically driven air conditioner compressor

– After charging the refrigerant circuit, an electrically driven air conditioner compressor is first to be started up by way of the „Compressor run-in“ function of the basic setting routine ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner and battery regulation

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3 General information on refrigerant circuit

Vehicles with high-voltage system (hybrid vehicles)

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

WARNING

Working on vehicles with high-voltage wiring:

- *Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.*
- *High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.*
- *The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.*

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DANGER!

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Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

If work is necessary in the vicinity of high-voltage system components, perform a visual inspection of the high-voltage components and wiring to check for damage ⇒ page 6 and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

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De-energising high-voltage system

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- *It must be definitely confirmed that the high-voltage system is de-energised. The system may only be de-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
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Note

- *De-energising high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
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Re-energising high-voltage system

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- `Function/component selection`
- `Body`
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- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - Re-energise high-voltage system (Rep. gr. 93)`

Vehicles with start/stop system

WARNING

Injury risk due to automatic engine start (vehicles with start/stop system).

- *On vehicles with an activated start/stop system (indicated by a message in the instrument cluster display), the engine may start automatically on demand.*
- *Therefore, please make sure that the start/stop system is deactivated when performing repair work on the vehicle (switch off the ignition, and switch it on again if required).*

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All vehicles

- Components of refrigerant circuit ⇒ page 44
- Layout of components of refrigerant circuit and their influence on high-pressure and low-pressure sides ⇒ page 44
- Design of refrigerant circuit ⇒ page 62
- Connections for quick-release coupling in refrigerant circuit ⇒ page 67
- Switches and senders in refrigerant circuit and related connections ⇒ page 70
- Electrical components not installed in refrigerant circuit ⇒ page 74
- Pressures and temperatures in refrigerant circuit ⇒ page 75
- Tests and measurements performed with pressure gauge ⇒ page 80
- Air conditioner service and recycling units ⇒ page 81
- Repair notes for refrigerant circuit ⇒ page 82

3.1 Components of refrigerant circuit

- All components of the refrigerant circuit submitted for quality analysis should always be sealed (use original sealing caps of replacement part).
- Renew damaged or leaking components of refrigerant circuit ⇒ page 246 .

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Note

The following replacement parts (air conditioner compressor, reservoir, evaporator and condenser) have so far been filled with nitrogen gas. This charge is being gradually discontinued. Consequently, no or only very slight pressure equalisation is perceptible on unscrewing the sealing plugs from the replacement part.

3.2 Layout of components of refrigerant circuit and their influence on high-pressure and low-pressure sides

High-pressure end: Condenser, receiver and restrictor or expansion valve to separate the high and low-pressure liquid ends.

High pressure results from the restrictor or expansion valve forming a constriction and causing the refrigerant to accumulate, thus leading to an increase in pressure and temperature.

Excess pressure occurs if too much refrigerant or refrigerant oil is used, the condenser is contaminated, the radiator fan is defective, the system is blocked or in the event of moisture in the refrigerant circuit (icing-up of restrictor or expansion valve).

Low-pressure end: Evaporator, evaporator temperature sensor and air conditioner compressor to separate the high and low-pressure gas ends.

A drop in system pressure can be caused by a loss of refrigerant, the restrictor or expansion valve (constrictions), a defective air conditioner compressor or an iced-up evaporator.

- Mechanically driven air conditioner compressor ⇒ page 46

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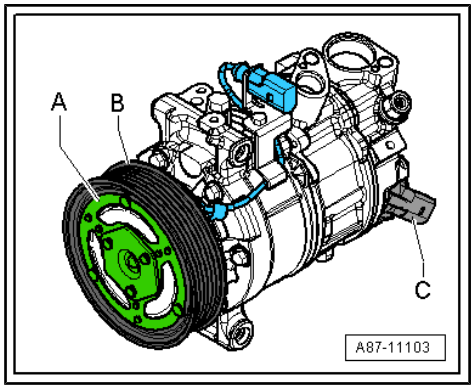
- Electrically driven air conditioner compressor for hybrid vehicles ⇒ page 47
- Condenser ⇒ page 54
- Evaporator ⇒ page 54
- Reservoir ⇒ page 54
- Restrictor ⇒ page 55
- Receiver ⇒ page 56
- Expansion valve ⇒ page 57
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- ⇒ „3.2.10 Refrigerant shut-off valve 1 for hybrid battery N516 “, page 59
- Refrigerant line with internal heat exchanger ⇒ page 59
- Quick-release couplings on refrigerant line ⇒ page 60
- O-rings ⇒ page 61
- Pipes and hoses of refrigerant circuit ⇒ page 61
- High-pressure safety valve ⇒ page 62

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3.2.1 Mechanically driven air conditioner compressor

The air conditioner compressor is driven by the engine via a poly V-belt or a drive shaft.



Air conditioner compressor with magnetic clutch:

- An electromagnetic clutch -A- attached to the air conditioner compressor provides the power link between the pulley -B- and the compressor crankshaft when the air conditioning system is switched on.
- An overload safeguard attached to the clutch plate or fitted in the solenoid of the air conditioner compressor is triggered if the air conditioner compressor is not running smoothly in order to protect the belt drive against overload.

Air conditioner compressor with no magnetic clutch:

- An overload safeguard attached to the pulley -B- or fitted in the drive unit of the air conditioner compressor is triggered if the air conditioner compressor is not running smoothly in order to protect the belt drive against overload.

All air conditioner compressors

The air conditioner compressor draws in refrigerant gas from the evaporator, compresses it and conveys it to the condenser.

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Note

- *The air conditioner compressor contains refrigerant oil which mixes with refrigerant R134a at all temperatures.*
- *The rating plate indicates the refrigerant for which the air conditioner compressor is designed. A valve regulates the pressure on the low-pressure end within the specified range (control characteristic).*
- *At present, actuation is effected externally by way of a regulating valve -C- on air conditioner compressors with or without magnetic clutch.*
- *On air conditioner compressors with no magnetic clutch, the engine is only to be started following complete assembly of the refrigerant circuit.*
- *To prevent air conditioner compressor damage if the refrigerant circuit is empty, the magnetic clutch is deactivated and the air conditioner compressor regulating valve -N280- no longer actuated (air conditioner compressor idles with engine).*
- *If the refrigerant circuit is empty, an air conditioner compressor with no air conditioning system magnetic clutch -N25- (with air conditioner compressor regulating valve -N280-) is switched to internal lubrication by way of a valve.*
- *Depending on the version of the air conditioner compressor, the high-pressure end of the air conditioner compressor may be fitted with a valve to prevent the backflow of liquid refrigerant into the compressor after switching off the air conditioning system. If an air conditioner compressor with this valve is fitted on a vehicle with a refrigerant circuit with an expansion valve, a relatively long period may elapse before the pressure on the high-pressure end decreases (the expansion valve is cold and the pressure on the low-pressure end increases rapidly after switch-off, the expansion valve closes and the refrigerant can only flow slowly to the low-pressure end). If the air conditioner compressor is switched on, the pressure on the low-pressure end decreases, the expansion valve opens and the refrigerant can flow to the low-pressure end.*
- *In the case of air conditioner compressors with an electromagnetic clutch -A- and a regulating valve -C-, the electromagnetic clutch -A- is usually only actuated when the regulating valve -C- is actuated as well ⇒ Air conditioning; Rep. gr. 87 .*

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3.2.2 Electrically driven air conditioner compressor for vehicles with a high-voltage system

Hybrid vehicles

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

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WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

WARNING

Working on vehicles with high-voltage wiring:

- *Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.*
- *High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.*
- *The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.*

DANGER!

Risk of fatal injury if high-voltage components are damaged.

Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

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If work is necessary in the vicinity of high-voltage system components, perform a visual inspection of the high-voltage components and wiring to check for damage ⇒ page 6 and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

If work is necessary on high-voltage system components, de-energise the high-voltage system ⇒ Electrical system; Rep. gr. 93 ; De-energising high-voltage system and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

De-energising high-voltage system

DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be de-energised by a suitably qualified person (Audi high-voltage technician).*
- *It must be definitely confirmed that the high-voltage system is de-energised. The system may only be de-energised using the vehicle diagnostic tester via „Guided Fault Finding“.*
- *The qualified person (Audi high-voltage technician) confirms that the system is de-energised and uses the locking cap -T40262- to ensure that the system cannot be re-energised. The ignition key and the maintenance connector for high-voltage system - TW - should then be stored in a safe place by the qualified person.*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

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Note

- *De-energising high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - De-energise high-voltage system (Rep. gr. 93)`

Re-energising high-voltage system

DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- ***Voltage levels in the high-voltage system constitute a safety hazard.***
- ***For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.***
- ***The high-voltage system may only be re-energised by a suitably qualified person (Audi high-voltage technician).***
- ***The system may only be re-energised using the vehicle diagnostic tester via „Guided Fault Finding".***
- ***The vehicle is then made ready for operation again by the qualified person (Audi high-voltage technician).***
- ***The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.***

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Note

- *Re-energise high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - Re-energise high-voltage system (Rep. gr. 93)`

DANGER!

When working on a vehicle with the ignition switched on or while the drive system is active, the engine can start unexpectedly and exhaust fumes can cause a health hazard in closed rooms. Moving parts can trap or draw in parts of the body and/or clothing (safety hazard).

Before switching on the ignition, perform the following steps:

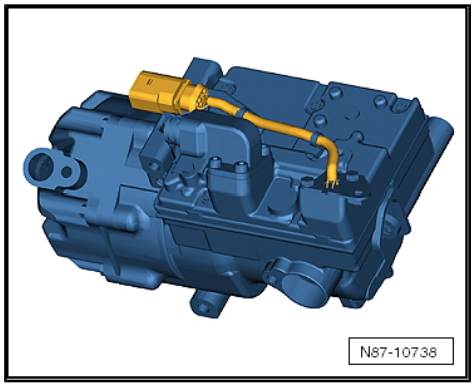
- *Move selector lever to position P*
- *Activate parking brake*
- *Switch off ignition*
- *Open bonnet*
- *Connect battery charger (e.g. -VAS 5095A-) to jump-start connections of 12 V electrical system*
- *Switch on ignition*

– To minimise the number of automatic engine starts when the vehicle's drive system is active during test and measurement work, charge the vehicle batteries e.g. with the battery charger 60A -VAS 5904- in battery standby mode ⇒ Electrical system; Rep. gr. 27 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

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– For test and measurement work that requires the vehicle's drive system to be active or the ignition to be switched on, move the selector lever to position „P“, activate the parking brake and arrange the tools needed so that they cannot come into contact with moving components of the engine and so that they cannot even come near to components that turn when the engine is running.



Electrically driven air conditioner compressor

WARNING

Danger of short circuit

The air conditioner compressor operates at up to 288 V in a speed range between 800 and 8600 rpm.

Avoid contact with the air conditioner compressor when switching on the ignition or starting the drive units - danger of short circuit.

- The air conditioner compressor draws refrigerant gas from the evaporator, compresses it and sends it to the condenser.
- The electric motor of the air conditioner compressor is supplied with power by the power and control electronics for electric drive -JX1- .
- The control unit for air conditioning compressor -J842- integrated into the air conditioner compressor regulates the speed and thus the output of the air conditioner compressor (electrical air conditioner compressor -V470-) on the basis of the request received via the data bus ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner and battery regulation .
- The electrically driven air conditioner compressor is not fitted with an air conditioner compressor regulating valve -N280- .
- Prior to installation, check the air conditioner compressor and holder attachment points. The contact surfaces must be clean and free from rust and grease. If this is not the case, treat the contact surfaces accordingly with the contact surface cleaning set -VAS 6410- ⇒ Electrical system general information; Rep. gr. 97 ; Repair set VAS 6410 .

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Note

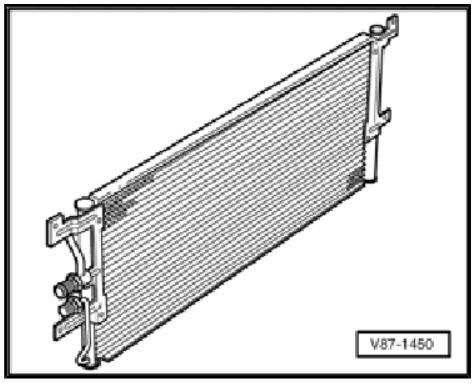
- *If the control unit for air conditioning compressor -J842- is defective, the amount of refrigeration oil in the new air conditioner compressor must be adjusted. The refrigerant circuit does not have to be flushed with R134a.*
- *The control unit for air conditioning compressor -J842- and the electrical air conditioner compressor -V470- form one component and cannot be separated at present.*
- *The electrically driven air conditioner compressor is not fitted with -N280- . The output of the air conditioner compressor is regulated externally by way of the air conditioner compressor speed ⇒ Current flow diagrams, Electrical fault finding and Fitting locations and ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner and battery regulation .*
- *At present, the electrically driven air conditioner compressor operates on the principle of a spiral-type supercharger.*
- *The air conditioner compressor contains refrigerant oil which mixes with refrigerant R134a at all temperatures.*
- *The rating plate indicates the refrigerant for which the air conditioner compressor is designed.*
- *The integrated electronics regulate the output of the air conditioner compressor (and thus the pressure on the low-pressure end) within the specified range (control characteristic) by way of the speed.*
- *The engine should only be started after the refrigerant circuit has been assembled completely.*
- *The air conditioner compressor has an internal oil circuit to ensure that the air conditioner compressor is not damaged when the refrigerant circuit is empty. This means that roughly 40 to 50 cm^3 of refrigeration oil remains in the air conditioner compressor.*
- *Like the mechanically driven air conditioner compressor, the electrically driven air conditioner compressor has a high-pressure safety valve.*
- *On vehicles with battery cooling, hybrid operation is only possible with the air conditioner charged and with no air conditioner faults stored ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner and battery regulation .*
- *After installing the air conditioner compressor and then filling the refrigerant circuit, first start up the electrically driven air conditioner compressor by way of the „Compressor run-in“ function of the basic setting routine. Otherwise, the air conditioner compressor may be damaged if refrigeration oil has accumulated in the compression chamber of the air conditioner compressor on account of inappropriate storage prior to installation ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner and battery regulation*
- *Electrically driven air conditioner compressors are only to be actuated with the refrigerant circuit charged. Running the air conditioner compressor with the refrigerant circuit empty could lead to compressor damage ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner and battery regulation .*

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3.2.3 Condenser

The condenser transfers heat from the compressed refrigerant gas to the surrounding air.

In this process, the refrigerant gas condenses to form liquid.



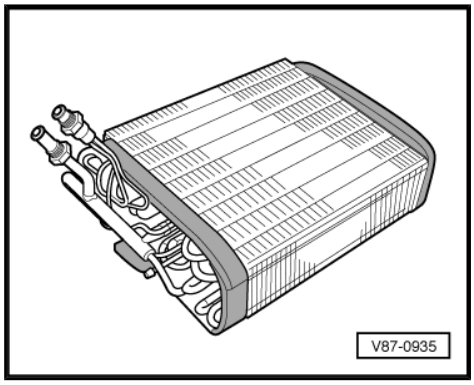
Note

Depending on the design of the refrigerant circuit, the receiver may be attached to the condenser or installed in (integrated into) the condenser ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .

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3.2.4 Evaporator

The liquid refrigerant evaporates in the tubes of the evaporator. The required heat is extracted from the air flowing past the evaporator ribs. The air cools down. The refrigerant evaporates and is drawn in by the air conditioner compressor together with the heat absorbed.



A defined quantity of refrigerant is supplied to the evaporator by way of a restrictor or expansion valve. In systems with an expansion valve the flow rate is regulated such that only gaseous refrigerant emerges at the evaporator outlet.

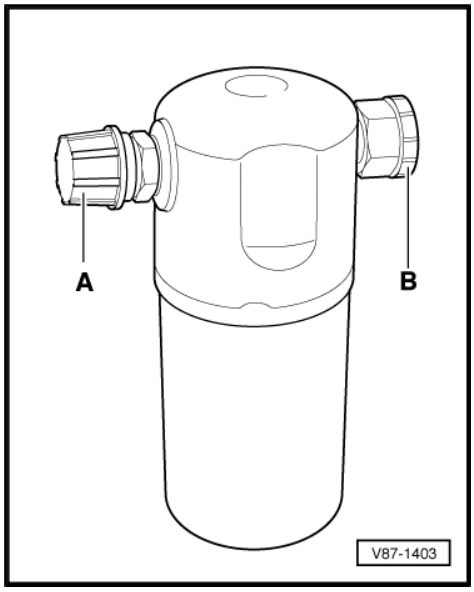
3.2.5 Reservoir

To ensure that the air conditioner compressor draws in only gaseous refrigerant, the reservoir collects the mixture of vapour and gas coming from the evaporator. The vapour becomes gaseous refrigerant.

Refrigerant oil entrained in the circuit does not remain in the reservoir as an oil extraction hole is provided.

Any moisture ingressing into the refrigerant circuit during assembly is trapped by a filter (desiccant bag) in the reservoir.

Gaseous refrigerant with oil is drawn in by the air conditioner compressor.



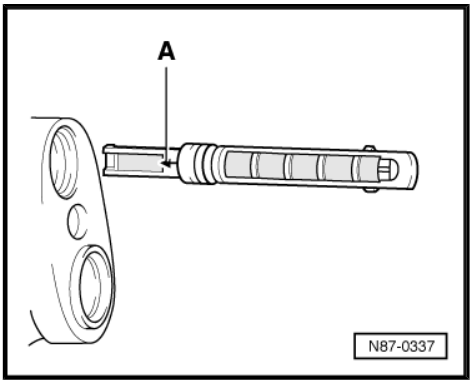
Note

- *Renew reservoir if refrigerant circuit has been open for a relatively long period and moisture has ingressed, or if renewal is stipulated due to a specific complaint ⇒ page 246 .*
- *Do not remove the sealing plugs -A- and -B- until immediately prior to installation.*
- *If the reservoir is not sealed, the desiccant bag soon becomes saturated with moisture and thus unusable.*
- *When installing, observe arrow indicating direction of flow (if applicable).*

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3.2.6 Restrictor

The restrictor creates a constriction. This restriction limits the flow, separating the high-pressure and low-pressure sides in the refrigerant circuit. Upstream of the restrictor, the refrigerant is warm due to the high pressure. Downstream of the restrictor, the refrigerant is cold due to the low pressure. Upstream of the narrow point is a strainer to catch dirt and downstream of the narrow point is a strainer to atomise the refrigerant before it enters the evaporator.



Note

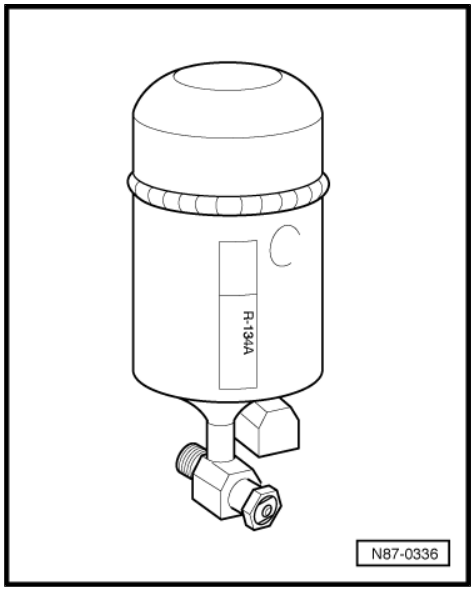
- *Arrow -A- on restrictor faces evaporator.*
- *Always renew after opening circuit.*
- *There are different versions; observe the notes in the service information media available ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific Workshop Manual) and ⇒ Electronic parts catalogue .*

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3.2.7 Receiver

The receiver collects the droplets of liquid and conveys them in a continuous flow to the expansion valve. Any moisture ingressing into the refrigerant circuit during assembly is collected by a dryer in the receiver.



Note

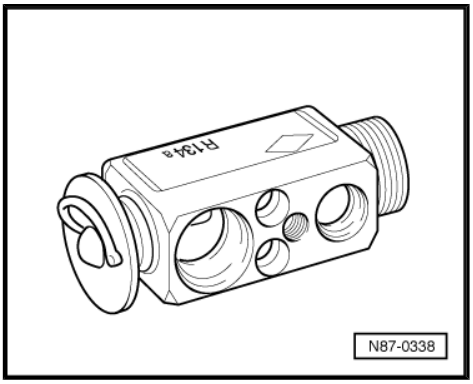
- *Renew receiver if refrigerant circuit has been open for a relatively long period and moisture has ingressed, or if renewal is stipulated due to a specific complaint ⇒ page 246 .*
- *Do not remove the sealing plugs until immediately prior to installation.*
- *If the receiver is not sealed, the desiccant bag soon becomes saturated with moisture and thus unusable.*
- *When installing, observe arrow indicating direction of flow (if applicable).*
- *Depending on the design of the refrigerant circuit, the receiver may also be attached to the condenser or installed in (integrated into) the condenser ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*
- *The procedure for dealing with problems differs depending on the version of the receiver / dryer cartridge. If, for example, the receiver is attached to the condenser, it can be renewed together with the dryer cartridge. If, for example, the receiver is integrated into the condenser, it is usually possible to renew the dryer cartridge and any additional filter element separately. If the receiver is integrated into the condenser and it is not possible to renew the receiver/dryer cartridge separately, it may be necessary to renew the entire condenser ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*
- *Depending on the design of the refrigerant circuit, the desiccant bag (dryer cartridge) may also be installed in the condenser ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*

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3.2.8 Expansion valve

The expansion valve atomises the refrigerant flowing in and controls the flow rate in line with the quantity of heat transferred such that it does not become gaseous before reaching the evaporator outlet.



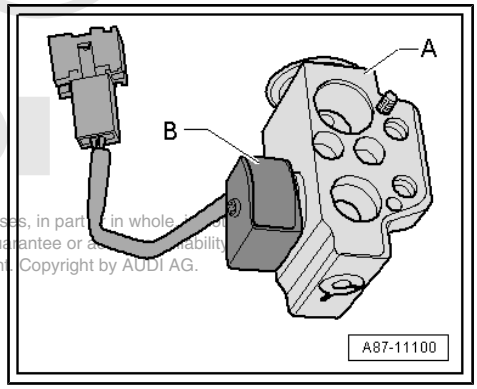
Note

- *Pay attention to the correct part number on renewing the expansion valve. ⇒ Electronic parts catalogue*
- *Different characteristic curves matched to the appropriate circuit ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*
- *Depending on the version of the air conditioner compressor, the high-pressure end of the air conditioner compressor may be fitted with a valve to prevent the backflow of liquid refrigerant into the compressor after switching off the air conditioning system. If an air conditioner compressor with this valve is fitted on a vehicle with a refrigerant circuit with an expansion valve, a relatively long period may elapse before the pressure on the high-pressure end decreases (the expansion valve is cold and the pressure on the low-pressure end increases rapidly after switch-off, the expansion valve closes and the refrigerant can only flow slowly to the low-pressure end). If the air conditioner compressor is switched on, the pressure on the low-pressure end decreases, the expansion valve opens and the refrigerant can flow to the low-pressure end.*

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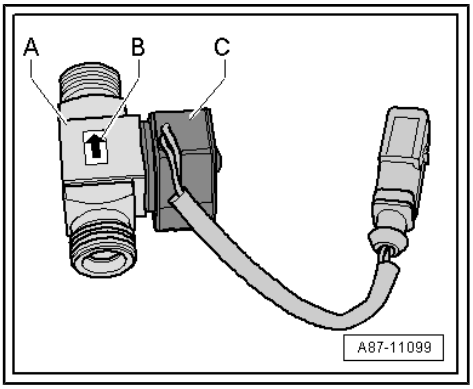
3.2.9 Expansion valve with refrigerant shut-off valve 2 for hybrid battery -N517-



- The expansion valve -A- with -N517- -B- atomises the refrigerant flowing through and regulates the flow of refrigerant to the evaporator in the battery cooling module of the hybrid battery unit -AX1- so that - depending on the heat transferred - the vapour only turns into gas at the outlet of the evaporator.
- When -N517- -B- is actuated by the electronic system, it is open and allows refrigerant to flow through the expansion valve -A- to the evaporator in the battery cooling module.
- The expansion valve -A- with -N517- -B- is installed on vehicles with battery cooling module. It is actuated in air conditioning mode if the hybrid battery unit -AX1- needs to be cooled.
- If -N517- -B- is actuated by the electronic system (e.g. by the battery regulation control unit -J840-), it is opened and allows refrigerant to flow to the evaporator in the battery cooling module according to its control characteristics.
- The solenoid -N517- -B- (fitted at expansion valve -A-) is actuated e.g. by the battery regulation control unit -J840- ⇒ Current flow diagrams, Electrical fault finding and Fitting locations and ⇒ Vehicle diagnostic tester in „Guided Fault Finding“ mode for air conditioner and battery regulation .
- If, on a vehicle with two evaporators (one each in air conditioning unit and battery cooling module), the measured temperature corresponds to or is below the specified value at one evaporator but the required specified value is not attained at the other evaporator, the system is controlled as follows: The battery regulation control unit -J840- actuates the electric air conditioner compressor at a higher speed via the power and control electronics for electric drive -JX1- and the control unit for air conditioning compressor -J842- . This causes the cooling output of the air conditioner to increase and the pressure on the low-pressure side and the evaporator temperature to drop. If the temperature set value is then not reached at one evaporator, -J840- actuates the shut-off valve 1 for refrigerant of hybrid battery -N516- or the shut-off valve 2 for refrigerant of hybrid battery -N517- such that refrigerant no longer flows through the evaporator which is too cold ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner

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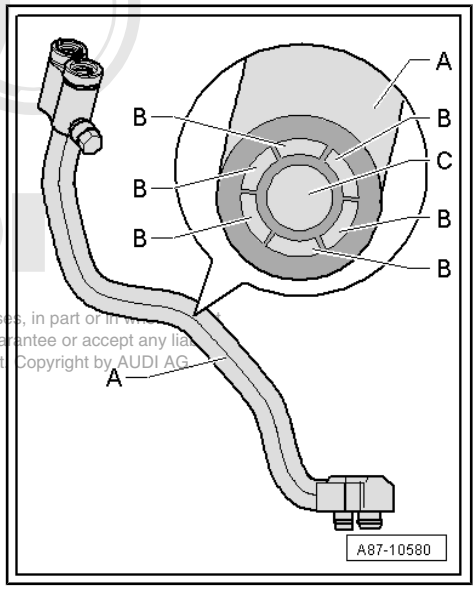
3.2.10 Refrigerant shut-off valve 1 for hybrid battery -N516-



- When -N516- -A- is not actuated by the electronic system, it is open and allows refrigerant to flow to the evaporator in the air conditioning unit.
- -N516- -A- is installed on vehicles with battery cooling module. It is actuated in hybrid mode if the air conditioner is not set to cooling mode for the passenger compartment, but the hybrid battery unit -AX1- needs to be cooled.
- Observe arrow -B- on -N516- -A-; it shows the flow direction of the refrigerant (from condenser to evaporator in air conditioning unit).
- The solenoid -C- (fitted at -N516-) is actuated e.g. by the battery regulation control unit -J840- ⇒ Current flow diagrams, Electrical fault finding and Fitting locations and ⇒ Vehicle diagnostic tester in „Guided Fault Finding“ mode for air conditioner and battery regulation .
- If, on a vehicle with two evaporators (one each in air conditioning unit and battery cooling module), the measured temperature corresponds to or is below the specified value at one evaporator but the required specified value is not attained at the other evaporator, the system is controlled as follows: The battery regulation control unit -J840- actuates the electric air conditioner compressor at a higher speed via the power and control electronics for electric drive -JX1- and the control unit for air conditioning compressor -J842- . This causes the cooling output of the air conditioner to increase and the pressure on the low-pressure side and the evaporator temperature to drop. If the temperature set value is then not reached at one evaporator, -J840- actuates the shut-off valve 1 for refrigerant of hybrid battery -N516- or the shut-off valve 2 for refrigerant of hybrid battery -N517- such that refrigerant no longer flows through the evaporator which is too cold ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner

3.2.11 Refrigerant line with internal heat exchanger

In this refrigerant line, the hot refrigerant (liquid) flowing through the high-pressure side gives off energy to the cold refrigerant (gaseous or vaporous) flowing through the low-pressure side, thus enhancing the efficiency of the air conditioner.



Note

This illustration shows a refrigerant line with an internal heat exchanger as fitted for example on the Audi A4 2008 > and the Audi A5 Coupé 2008 > ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

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A - Refrigerant line with internal heat exchanger

B - Channels in the refrigerant line in which the hot liquid refrigerant flows to the evaporator (high-pressure end of the refrigerant circuit).

C - Channel in the refrigerant line in which the cold refrigerant gas or vapour flows to the air conditioner compressor (low-pressure end of the refrigerant circuit).

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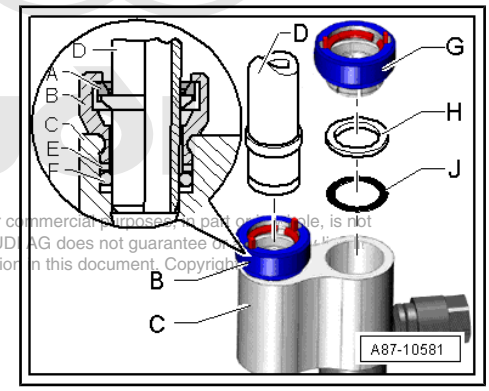
3.2.12 Quick-release couplings on refrigerant line

WARNING

Only release and open the quick-release couplings after completely discharging the refrigerant circuit.

Note

- *This illustration shows the quick-release couplings with a refrigerant pipe with an internal heat exchanger as fitted for example on the Audi A4 2008 > and the Audi A5 Coupé 2008 > ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *Removal of the refrigerant line -D- involves opening the retaining ring -A- with the refrigerant line release tool -T40149/- for example ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *Following removal of the applicable refrigerant line, the quick-release couplings -B- and -G- are to be renewed together with the corresponding support ring -E- or -H- and the corresponding O-ring -F- or -J- ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*



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A - Retaining ring (in quick-release coupling, high-pressure side)

B - Quick-release coupling with retaining ring („high-pressure side“)

C - Refrigerant pipe with an internal heat exchanger

D - Refrigerant line („high-pressure side“)

E - Support ring („high-pressure side“)

F - O-ring („high-pressure side“)

G - Quick-release coupling with retaining ring („low-pressure side“)

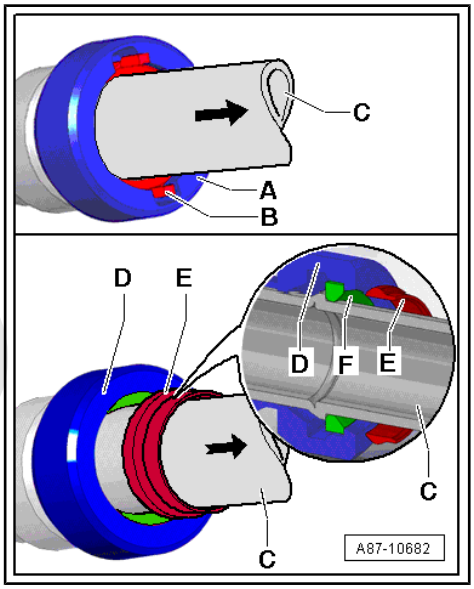
H - Support ring („low-pressure side“)

J - O-ring („low-pressure side“)

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Note

- *There are different versions of the quick-release couplings -A- and -D-. With both versions of these quick-release couplings, the refrigerant lines -C- can be released in the identical manner using the refrigerant line release tool -T40149/1- for example and removed.*
- *With the quick-release coupling -A- fitted at the start of production, the pins -B- become visible after fitting the refrigerant line -C- if the locked refrigerant line -C- is pulled in arrow direction.*
- *With the quick-release coupling -D- installed from model year 2010 onwards (gradual introduction), the refrigerant line -C- is installed in the same way as with the quick-release coupling -A-. If, on this version, the refrigerant line -C- is pulled in the direction of the arrow after it is assembled, the snap ring -E- emerges from the quick-release coupling -D-, showing that the retaining ring -F- is completely locked onto the refrigerant line -C-. Subsequently the snap ring -E- must be detached from the refrigerant line -C-.*



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3.2.13 O-rings

These rings seal the joints between the individual components of the refrigerant circuit.

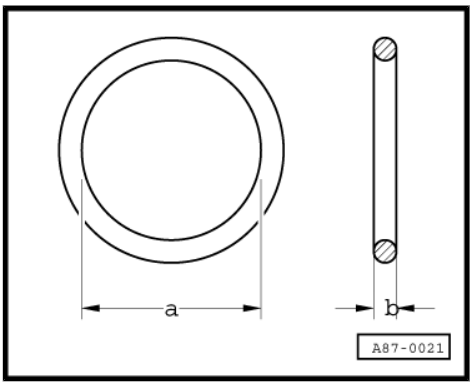
Only O-rings resistant to R134a refrigerant and the related refrigerant oils are to be used. This is guaranteed if genuine replacement parts are used.

O-rings:

– Use only once.

– Observe correct diameters -a- and -b-.

– Moisten with refrigerant oil before fitting ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .



Note

The colour coding of O-rings for R134a refrigerant circuits has been discontinued. Use is made of black and coloured O-rings ⇒ Electronic parts catalogue and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

3.2.14 Pipes and hoses of refrigerant circuit

The mixture of refrigerant oil and refrigerant R134a corrodes certain metals (e.g. copper) and alloys and dissolves certain hose materials. Therefore, always use genuine replacement parts.

The pipes and hoses are joined with bolted connections or special connectors.

Note

Observe specified torques for bolted connections and use the envisaged release tools for connectors.

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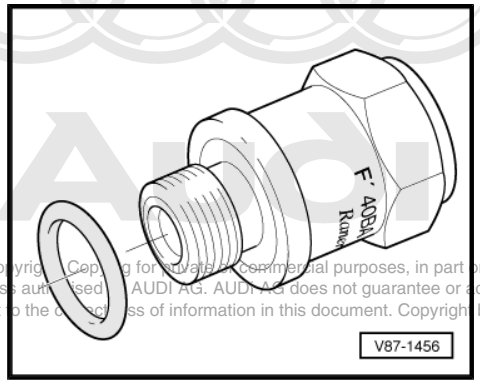
3.2.15 High-pressure safety valve

The high-pressure safety valve is fitted to the air conditioner compressor or the receiver.

The valve opens at a pressure of approx. 38 bar and closes again when the pressure has dropped (approx. 30 bar).

Not all the refrigerant escapes.

Certain versions feature a transparent plastic disc which breaks off as soon as the valve responds.

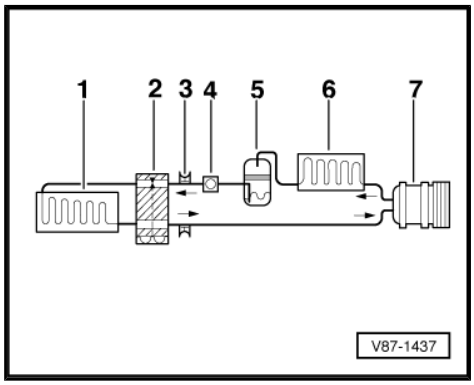


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3.3 Design of refrigerant circuit

- Refrigerant circuit with expansion valve and evaporator ⇒ page 62
- Refrigerant circuit with restrictor and reservoir ⇒ page 62
- Refrigerant circuit with electrically driven air conditioner compressor (with and without battery cooling module) ⇒ page 63

3.3.1 Refrigerant circuit with expansion valve and evaporator

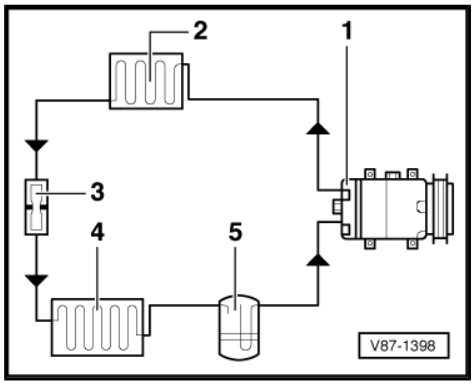


1 - Evaporator
2 - Expansion valve
3 - Valve for extraction, charging and measurement
4 - Sight glass (not fitted with R134a circuits)
5 - Receiver with dryer
6 - Condenser
7 - Air conditioner compressor

Note

Arrows show direction of refrigerant flow.

3.3.2 Refrigerant circuit with restrictor and reservoir



1 - Air conditioner compressor
2 - Condenser
3 - Restrictor
4 - Evaporator
5 - Reservoir

Note

Arrows show direction of refrigerant flow.

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3.4 Refrigerant circuit with electrically driven air conditioner compressor (with and without battery cooling module)

Vehicles with high-voltage system (hybrid vehicles)

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

WARNING

Working on vehicles with high-voltage wiring:

- *Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.*
- *High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.*
- *The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.*

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DANGER!

Risk of fatal injury if high-voltage components are damaged.

Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

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If work is necessary in the vicinity of high-voltage system components, perform a visual inspection of the high-voltage components and wiring to check for damage ⇒ page 6 and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

If work is necessary on high-voltage system components, de-energise the high-voltage system ⇒ Electrical system; Rep. gr. 93 ; De-energising high-voltage system and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

De-energising high-voltage system

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DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be de-energised by a suitably qualified person (Audi high-voltage technician).*
- *It must be definitely confirmed that the high-voltage system is de-energised. The system may only be de-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The qualified person (Audi high-voltage technician) confirms that the system is de-energised and uses the locking cap -T40262- to ensure that the system cannot be re-energised. The ignition key and the maintenance connector for high-voltage system - TW - should then be stored in a safe place by the qualified person.*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

Note

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- *De-energising high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - De-energise high-voltage system (Rep. gr. 93)`

Re-energising high-voltage system

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DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- ***Voltage levels in the high-voltage system constitute a safety hazard.***
- ***For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.***
- ***The high-voltage system may only be re-energised by a suitably qualified person (Audi high-voltage technician).***
- ***The system may only be re-energised using the vehicle diagnostic tester via „Guided Fault Finding".***
- ***The vehicle is then made ready for operation again by the qualified person (Audi high-voltage technician).***
- ***The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.***

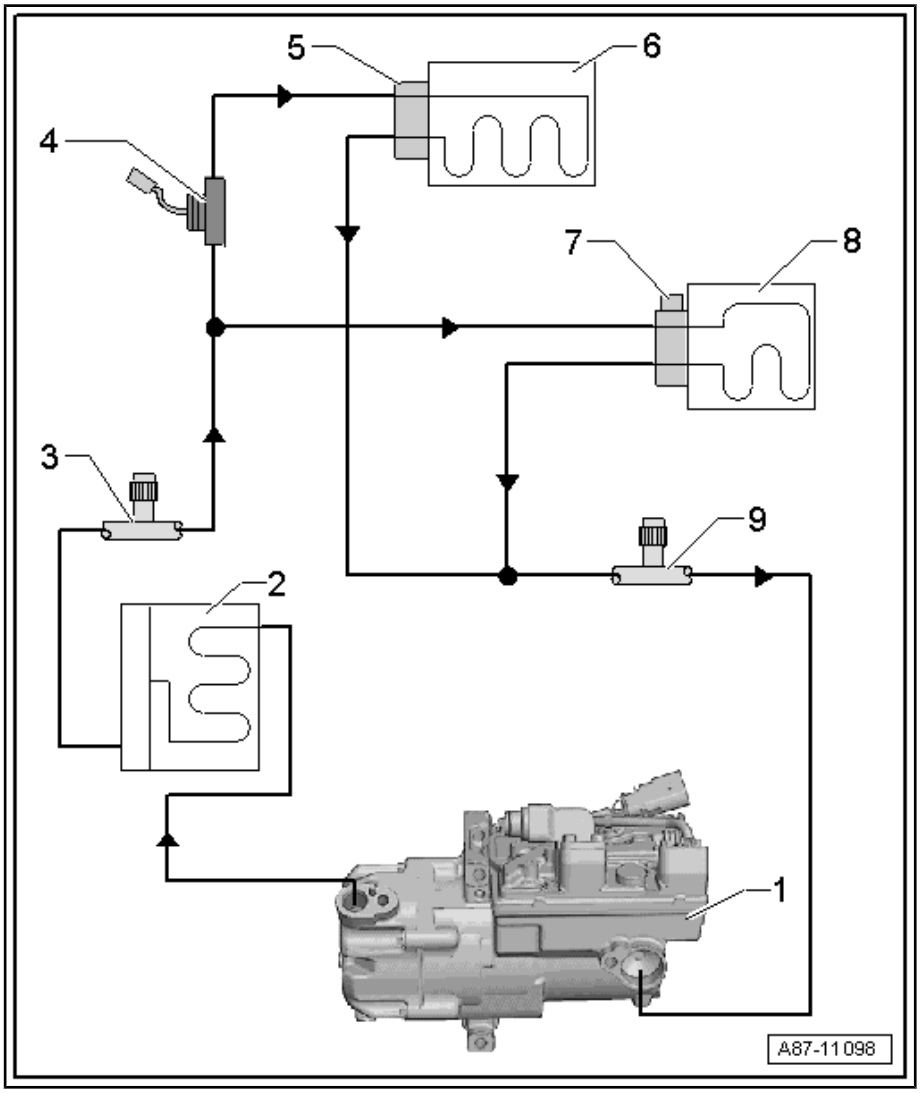
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Note

- *Re-energise high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - Re-energise high-voltage system (Rep. gr. 93)`

Arrows show direction of refrigerant flow.

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1 - Electrically driven air conditioner compressor

- ❑ With control unit for air conditioning compressor -J842- and electrical air conditioner compressor -V470-

2 - Condenser

- ❑ With receiver and dryer cartridge

3 - Service connection/high-pressure end

4 - Refrigerant shut-off valve 1 for hybrid battery -N516-

- ❑ Vehicles with battery cooling module for hybrid battery unit -AX1- only

Note

5 - Expansion valve

- ❑ At evaporator in air conditioning unit

6 - Evaporator

- ❑ Evaporator in air conditioning unit

7 - Expansion valve with refrigerant shut-off valve 2 for hybrid battery -N517-

- ❑ At evaporator in battery cooling module
- ❑ Vehicles with battery cooling module for hybrid battery unit -AX1- only

Note

8 - Evaporator

- ❑ Evaporator in battery cooling module
- ❑ Vehicles with battery cooling module for hybrid battery unit -AX1- only

9 - Service connection/low-pressure end

3.5 Connections for quick-release coupling in refrigerant circuit

- Only valves and connections resistant to R134a refrigerant and the related refrigerant oils are to be used.
- There are different connections (outer diameter) for high and low-pressure sides.
- Discharge refrigerant circuit before removing valves or valve cores.
- Always screw on sealing caps.

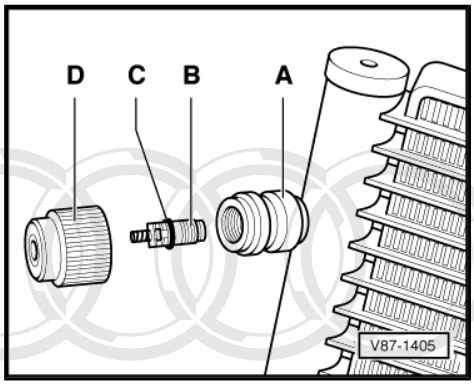
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Layout in vehicle ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific Workshop Manual).

- Connections with Schrader valve (needle valve) ⇒ page 68
- Connections with primary sealing valve (ball valve) ⇒ page 68

3.5.1 Connections with Schrader valve (needle valve)



- -A- Service connection (soldered in)
- -B- Valve core (designation: Schrader valve or needle valve)
- -C- O-ring (for valve)
- -D- Sealing cap with seal

Note

- *Following connection, carefully screw the handwheel of the service coupling into the quick-release coupling adapter to the extent required to reliably open the valve in the service connection (observe the pressure gauge; take care not to open the valve too far).*
- *To remove and install the valve core -B- with the refrigerant circuit drained, make use of an adapter from the socket - T10364- for example.*
- *Take care when tightening valve core -B- (low torque).*
- *There are different versions of these valves and the tightening torques therefore also differ. The tightening torque for a valve core -B- with a VG5 thread (5.2 x 0.7 mm, tyre valve) is 0.4 Nm +- 0.1 Nm. For a valve core with an M6 x 0.75 mm thread, the tightening torque is 0.9 Nm+- 0.1 Nm and for a valve core with an M8 x 1.0 mm thread it is 2.0 Nm+- 0.2 Nm.*
- *There are different versions of these valves, the valve cores and the corresponding sealing caps. Attention is to be paid to the correct version of the valve core and correct assignment of the sealing caps ⇒ Electronic parts catalogue .*

3.5.2 Connections with primary sealing valve (ball valve)

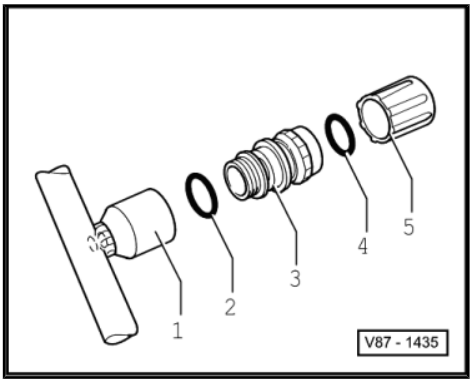
WARNING

Before unscrewing the connection, connect the air conditioner service station and extract refrigerant. The refrigerant circuit must be empty; danger of injury.

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Connection with high-pressure valve



1 - Connection with internal thread (soldered in)

2 - O-ring (version and identification: black or coloured ⇒ Electronic parts catalogue)

3 - Valve with external thread and groove for O-ring (designation: ball valve)

4 - Seal for sealing cap

5 - Cap

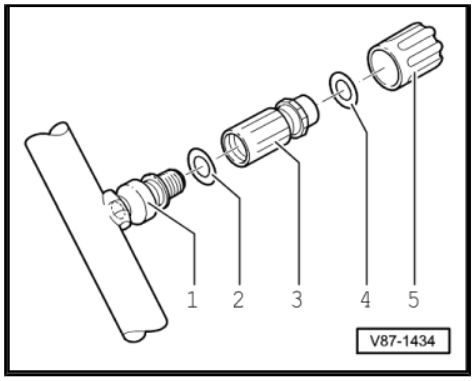
Note

- *Following connection, carefully screw the handwheel of the service coupling into the quick-release coupling adapter to the extent required to reliably open the valve in the service connection (observe the pressure gauge; take care not to open the valve too far).*
- *To remove and install the valve -3- with the refrigerant circuit drained, make use of an adapter from the socket -T10364- for example.*
- *There are different versions of these valves (with internal or external thread) and the tightening torques may therefore also differ. The tightening torque for the valves -3- used at present with an M12 x 1.5 mm external thread is 9 Nm +- 1 Nm.*
- *There are different versions of these valves and the corresponding sealing caps. Attention is to be paid to the correct version of the valve and correct assignment of the sealing cap ⇒ Electronic parts catalogue .*

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Connection with low-pressure valve



1 - Connection with external thread and groove for O-ring (soldered in)

2 - O-ring (version and identification: black or coloured ⇒ Electronic parts catalogue)

3 - Valve with internal thread

4 - Seal for sealing cap

5 - Cap

Note

- *Carefully screw the handwheel of the service coupling into the quick-release coupling adapter to the extent required to reliably open the valve in the service connection (observe the pressure gauge; take care not to open the valve too far).*
- *To remove and install the valve -3- with the refrigerant circuit drained, make use of an adapter from the socket -T10364- for example.*
- *There are different versions of these valves (with internal or external thread) and the tightening torques may therefore also differ. The tightening torque for the valves -3- used at present with an M10 x 1.25 mm internal thread is 9 Nm +- 1 Nm.*
- *There are different versions of these valves and the corresponding sealing caps. Attention is to be paid to the correct version of the valve and correct assignment of the sealing cap ⇒ Electronic parts catalogue .*

3.6 Switches and senders in refrigerant circuit and related connections

Note

Refer to vehicle-specific refrigerant circuit for switching pressures, switch removal/installation and switch layout/design ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

- High-pressure switch for air conditioning system -F23- ⇒ page 71
- High-pressure switch for magnetic clutch -F118- ⇒ page 71
- Low-pressure switch for air conditioning system -F73- ⇒ page 71
- Air conditioning system pressure switch -F129- ⇒ page 72
- High-pressure sender -G65- ⇒ page 72
- Refrigerant pressure and temperature sender -G395- ⇒ page 73
- Connections with valve for refrigerant circuit switches ⇒ page 71
- Air conditioner compressor regulating valve -N280- ⇒ page 73
- Air conditioning system compressor speed sender -G111- ⇒ page 74

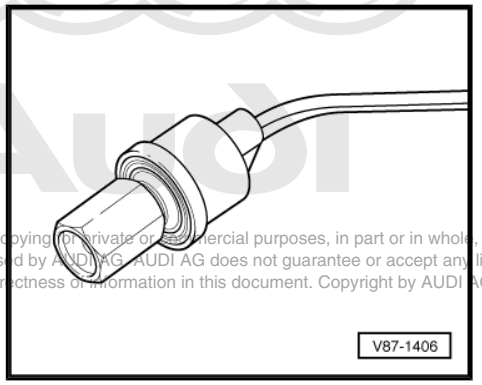
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♦ Refrigerant temperature sender -G454- ⇒ page 74

3.6.1 High-pressure switch for air conditioning system -F23-

Function:

Switches the radiator fan up to the next speed setting in the event of a pressure increase in the refrigerant circuit (approx. 16 bar).

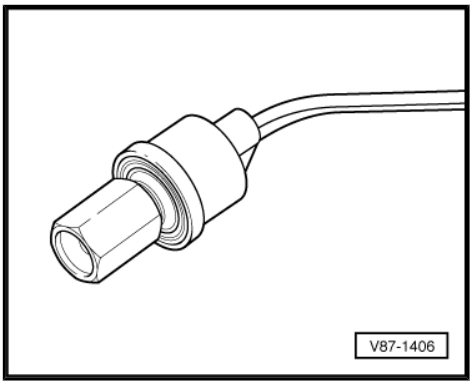


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3.6.2 High-pressure switch for magnetic clutch -F118-

Function:

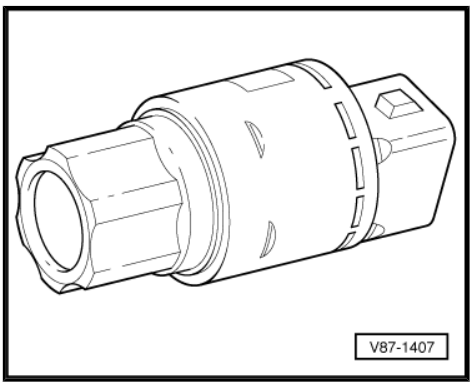
Switches off the air conditioner compressor in the event of excess pressure in the refrigerant circuit (approx. 32 bar).



3.6.3 Low-pressure switch for air conditioning system -F73-

Function:

Switches off the air conditioner compressor in the event of a pressure drop in the refrigerant circuit (approx. 2 bar).



3.6.4 Connections with valve for refrigerant circuit switches

- There are different threads for switches on the high and low pressure ends.
- Only valves and O-rings resistant to R134a refrigerant and the related refrigerant oils are to be used.

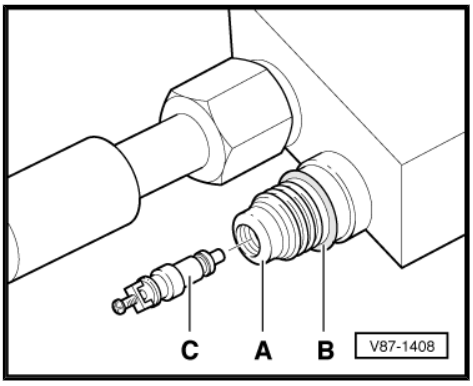
A - Connection (soldered in)

B - O-ring

C - Valve (with O-ring)

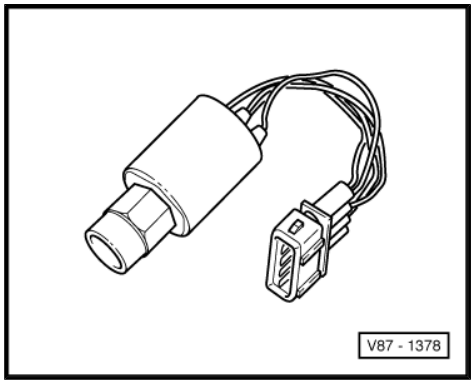
Note

To remove and install the valve core -C- with the refrigerant circuit drained, make use of an adapter from the socket -T10364- for example (tightening torque ⇒ page 68).



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3.6.5 Air conditioning system pressure switch -F129-



This pressure switch has 3 functions:

1. Switches the radiator fan up to the next speed setting in the event of a pressure increase (approx. 16 bar) in the refrigerant circuit.

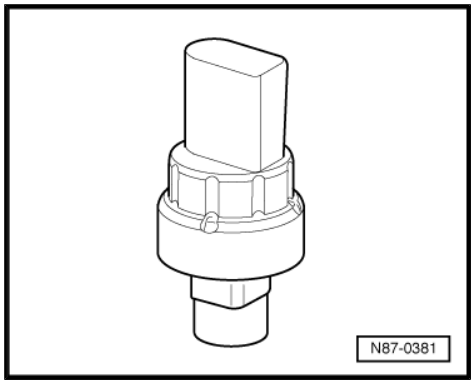
2. Switches off the air conditioner in the event of excessive pressure (approx. 32 bar) caused for example by inadequate engine cooling.

3. Switches off the air conditioner in the event of insufficient pressure (approx. 2 bar) caused for example by a loss of refrigerant.

Note

The air conditioning system pressure switch -F129- replaces the high-pressure switch for air conditioning system -F23- , the low-pressure switch for air conditioning system -F73- and the high-pressure switch for magnetic clutch -F118- .

3.6.6 High-pressure sender -G65-



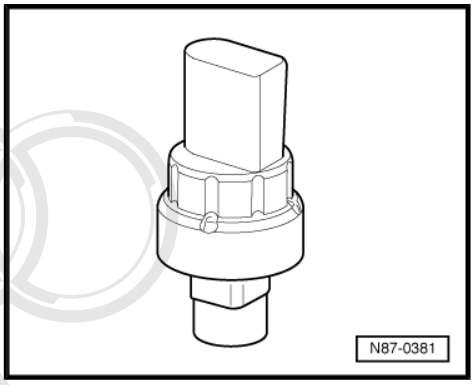
The high-pressure sender -G65- is fitted instead of the air conditioning system pressure switch -F129- or the refrigerant pressure and temperature sender -G395- .

- Depending on the version, the only outwardly visible difference between the refrigerant pressure and temperature sender -G395- and the high-pressure sender -G65- at present is the part number. Attention is therefore to be paid to the correct assignment on replacement (part number ⇒ Electronic parts catalogue). Reason: These two senders emit different signals, and the relevant control units can only evaluate the signal to which they have been matched ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific Workshop Manual).
- There are different versions of the high-pressure sender -G65- . The only outward difference between these may be the part number. Attention is therefore to be paid to the correct assignment on replacement (part number ⇒ Electronic parts catalogue). Reason: These two senders emit different signals, and the relevant control units can only evaluate the signal to which they have been matched ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific Workshop Manual).
- One version of the high-pressure sender -G65- generates a square-wave signal or data telegram when voltage is applied. This signal changes with the pressure in the system. The other version exchanges information with the corresponding control unit via the data bus (e.g. via the „LIN bus“) when voltage is applied ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).
- The downstream control units (radiator fan control unit, engine control unit, operating and display unit for Climatronic air conditioning system -E87- , Climatronic control unit -J255- etc.) use this signal to calculate the pressure in the refrigerant circuit and to actuate the radiator fans and the air conditioning system magnetic clutch -N25- accordingly or to modify actuation of the air conditioner compressor regulating valve -N280- ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

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3.6.7 Refrigerant pressure and temperature sender -G395-

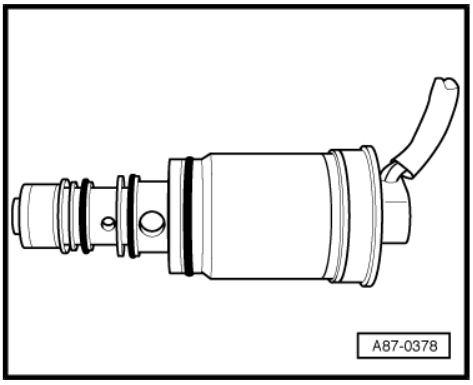


The refrigerant pressure and temperature sender -G395- is fitted instead of the high-pressure sender -G65- .

- Depending on the version, the only outwardly visible difference between the refrigerant pressure and temperature sender -G395- and the high-pressure sender -G65- at present is the part number. Attention is therefore to be paid to the correct assignment on replacement (part number ⇒ Electronic parts catalogue). Reason: These two senders emit different signals, and the relevant control units can only evaluate the signal to which they have been matched ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific Workshop Manual).
- When voltage is applied, the refrigerant pressure and temperature sender -G395- exchanges information with the corresponding control unit via the data bus (e.g. via the „LIN bus“). The relevant control unit uses this information to calculate the pressure and temperature in the refrigerant circuit and any faults detected are signalled to the control unit.
- The temperature measured by the refrigerant pressure and temperature sender -G395- differs on account of the design of -G395- and the fitting location from the actual temperature of the refrigerant in the refrigerant circuit. It is therefore not evaluated at present by all control units and used for air conditioner control ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).
- This information is used for example by the operating and display unit, Climatronic control unit -J255- to calculate the pressure in the refrigerant circuit and to actuate the downstream control units (radiator fan control unit, engine control unit etc.) by way of the data bus. These control units then regulate, for example, the radiator fans and engine accordingly ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

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3.6.8 Air conditioner compressor regulating valve -N280-



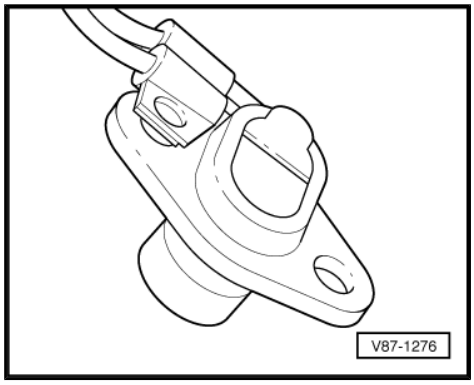
The regulating valve is installed in the air conditioner compressor. It is actuated by the operating and display unit for Climatronic air conditioning system -E87- or the Climatronic control unit -J255- (possibly via the data bus and an additional control unit depending on the vehicle) ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual). The pressure on the low-pressure end is influenced by the regulating valve, thus regulating the temperature in the evaporator.

Note

The air conditioner compressor regulating valve -N280- is part of the air conditioner compressor and cannot be renewed separately.

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3.6.9 Air conditioning system compressor speed sender -G111-



Inductive sender

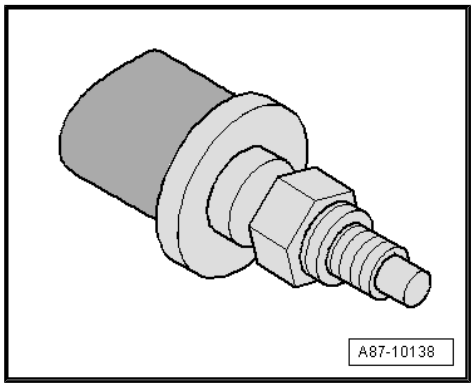
The sender pulses (4 per compressor revolution) and the engine speed enable the operating and display unit for Climatronic air conditioning system -E87- or the Climatronic control unit -J255- to calculate the belt slip.

If the belt slip exceeds a specified value, the air conditioner compressor is switched off by the control unit via the magnetic clutch.

Note

- *Fitted in Audi vehicles with compressor driven via poly V-belt and Zexel compressor ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*

3.6.10 Refrigerant temperature sender -G454-



The refrigerant temperature sender (with a temperature-sensitive resistor) is installed, for example, in the high-pressure line next to the air conditioner compressor.

In the refrigerant circuit, there is a direct relationship between temperature and pressure. If there is insufficient refrigerant in the circuit, the temperature in the refrigerant circuit during air conditioner operation will increase more sharply than envisaged for this pressure.

Note

- *Fitted, for example, on the Audi Q7 with certain engines ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.*
- *The operating and display unit, Climatronic control unit -J255- evaluates the pressure and the temperature in the refrigerant circuit and switches off the air conditioner compressor if the temperature increases above the value stored for this pressure ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Vehicle diagnostic tester („Self-diagnosis“ or „Guided Fault Finding“ function for the air conditioner).*

Printed from Elsa. Current flow diagrams, Electrical fault finding and Fitting locations
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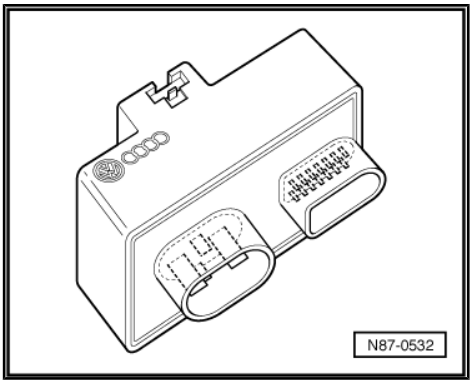
3.7 Electrical components not installed in refrigerant circuit

- Radiator fan control unit -J293- ⇒ page 75

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3.7.1 Radiator fan control unit -J293-

This control unit activates and deactivates the magnetic clutch and thus the air conditioner compressor. It switches the radiator fans and calculates the pressure in the refrigerant circuit on vehicles with a high-pressure sender -G65- . Refer to ⇒ Current flow diagrams, Electrical fault finding and Fitting locations and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).



3.8 Pressures and temperatures in refrigerant circuit

Caution

- ***When working on the refrigerant circuit, observe generally valid safety precautions and pressure vessel regulations.***

The pressures and temperatures in the refrigerant circuit depend on the instantaneous operating statuses (e.g. engine speed, radiator fan speed 1, 2, or 3, engine temperature, air conditioner compressor on or off) as well as environmental influences (e.g. ambient temperature, humidity, required cooling output).

On vehicles with air conditioner compressor regulating valve -N280- the pressure on the low pressure end is altered by actuating -N280- .

For these reasons, the values given in the following table are only to be taken as a guide. They are attained at an engine speed of 1500 to 2000 rpm and an ambient temperature of 20 °C after about 20 minutes.

Refer to the vehicle-specific refrigerant circuit for the pressure gauge set measurement connections ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

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At 20 °C with the engine not running, the pressure in the refrigerant circuit is 4.7 bar ⇒ page 15 (vapour pressure table).

Note

Pressure can be measured in various units: 1 MPa (megapascal) is equivalent to 10 bar gauge pressure, or 145 psi; 1 bar absolute pressure is the same as 0 bar gauge pressure, which is roughly equivalent to atmospheric pressure.

- Refrigerant circuit with expansion valve ⇒ page 75
- Refrigerant circuit with restrictor and reservoir ⇒ page 77

3.8.1 Refrigerant circuit with expansion valve

HP – High-pressure side of refrigerant circuit

LP – Low-pressure side of refrigerant circuit

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Component	State of refrigerant	Pressure (bar)	Temperature in degrees centigrade
-1- Evaporator, from inlet to outlet	Vapour	approx. 1.2 bar [1)]1	approx. -7 °C [2)]2
-2- Expansion valve	Liquid, expanded to vapour	approx. 14 bar	approx. +55 °C (high-pressure end), reduced to -7 °C (low-pressure end)
-3- High-pressure switch / high-pressure sender	Liquid	approx. 14 bar	approx. +55 °C
-4- Service connection/ high-pressure end and -5- Receiver	Liquid	approx. 14 bar	approx. +55 °C
-6- Condenser	From gas (at inlet) via vapour to liquid (at outlet)	approx. 14 bar	From approx. +65 °C (at inlet) to approx. +55 °C (at outlet)
-7- High-pressure safety valve and -8- Air conditioner compressor (HP side)	Gas	approx. 14 bar	approx. +65 °C
-9- Air conditioner compressor/low-pressure end	Gas	approx. 1.2 bar [1)]1	approx. -1 °C [2)]2
-10- Damping chamber (not fitted on all vehicles) and -11- Service connection/ low-pressure end	Gas	approx. 1.2 bar [1)]1	approx. -1 °C [2)]2

1) 1 - The pressure in a refrigerant circuit with a regulating air conditioner compressor is maintained at approx. 2 bar absolute (corresponding to approx. 1 bar gauge) despite varying heat transfer and fluctuating engine speeds. This however only applies within the output range of the air conditioner compressor. If the output limits of the air conditioner compressor are exceeded, the pressure will increase
⇒ page 188 .

2) 2 - The temperature in a refrigerant circuit with a regulating air conditioner compressor is maintained within the regulating range of the air conditioner compressor despite varying heat transfer and fluctuating engine speeds. This however only applies within the output range of the air conditioner compressor. If the output limits of the air conditioner compressor are exceeded, the temperature will increase
⇒ page 188 .

Note

- *Non self-regulating air conditioner compressors are switched off by the relevant control unit via the air conditioner compressor regulating valve -N280- at evaporator temperatures below 0 °C.*
- *On vehicles with air conditioner compressor regulating valve -N280- the pressure on the low pressure end is altered by actuating the valve.*
- *On vehicles with two evaporators and two expansion valves, the temperature and the pressure in the refrigerant circuit correspond to those on vehicles with only one evaporator and one expansion valve (parallel connection).*
- *Depending on the design of the refrigerant circuit, a component with an internal heat exchanger may be fitted (e.g. on the Audi A4 2008 > and the Audi A5 Coupé 2008 > a refrigerant line with an internal heat exchanger). In the internal heat exchanger, the hot refrigerant (liquid) flowing through the high-pressure side gives off energy to the cold refrigerant (gaseous or vaporous) flowing through the low-pressure side, thus enhancing the efficiency of the air conditioner* ⇒ page 59 .

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Arrows show direction of refrigerant flow.

HP – High-pressure side of refrigerant circuit

LP – Low-pressure side of refrigerant circuit

1 - Evaporator

2 - Expansion valve

3 - High-pressure switch / high-pressure sender

- ❑ Different versions depending on vehicle

4 - Service connection/high-pressure end

5 - Receiver

- ❑ Different versions depending on vehicle

6 - Condenser

7 - High-pressure safety valve

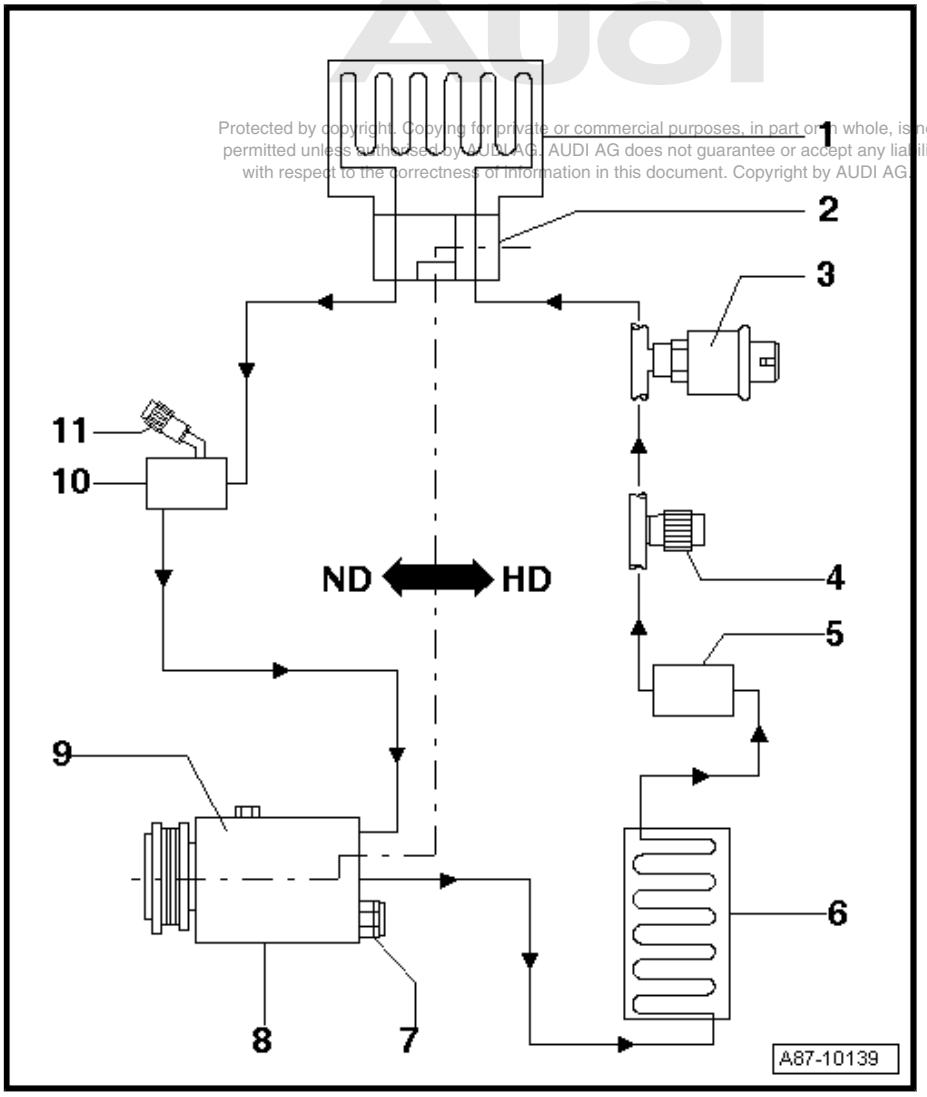
8 - Air conditioner compressor/ high-pressure end

9 - Air conditioner compressor/ low-pressure end

10 - Damping chamber

- ❑ Not fitted on all vehicles

11 - Service connection/low-pressure end



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3.8.2 Refrigerant circuit with restrictor and reservoir

HP – High-pressure side of refrigerant circuit

LP – Low-pressure side of refrigerant circuit

Component	State of refrigerant	Pressure (bar)	Temperature in degrees centigrade
-1- Air conditioner compressor/high-pressure end	Gas	Up to 20 bar	Up to +70 °C
-2- Condenser	From gas to vapour to liquid	Up to 20 bar	Up to +70 °C
-3- Restrictor	From liquid to vapour	HP side up to 20 bar, LP side greater than 1.0 bar	HP end up to +60 °C LP end warmer than -4 °C
-4- Evaporator	From vapour to gas	Greater than 1.0 bar	Warmer than -4 °C
-5- Reservoir	Gas		

Component	State of refrigerant	Pressure (bar)	Temperature in degrees centigrade
-6- Air conditioner compressor/low-pressure end	Gas		

The pressures on the low-pressure end are maintained at approx. 2 bar absolute (corresponding to approx. 1 bar gauge) by the „regulating“ air conditioner compressor even at varying engine speeds. This applies however only within the rated range of the air conditioner compressor ; if the rated range of the air conditioner compressor is exceeded, the pressure will increase ⇒ page 188 .

Note

On vehicles with air conditioner compressor regulating valve -N280- the pressure on the low pressure end is altered by actuating the valve.

Arrows show direction of refrigerant flow.

HP – High-pressure side of refrigerant circuit

LP – Low-pressure side of refrigerant circuit

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1 - Air conditioner compressor/ high-pressure end

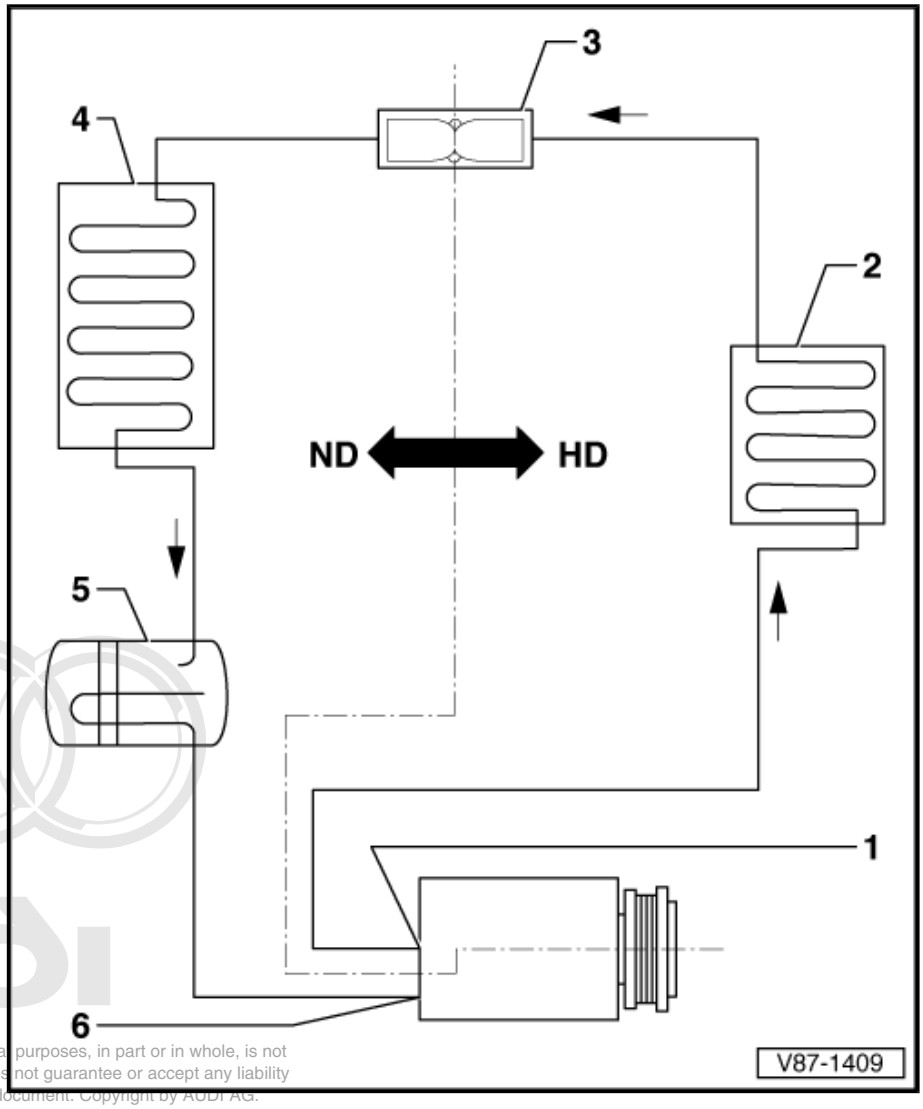
2 - Condenser

3 - Restrictor

4 - Evaporator

5 - Reservoir

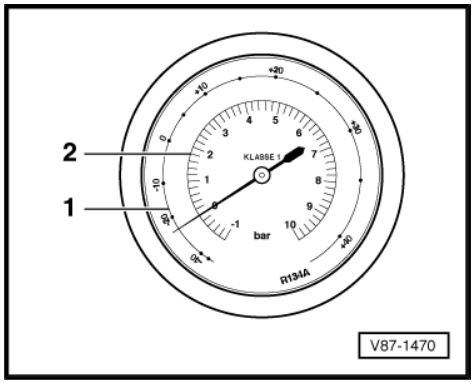
6 - Air conditioner compressor/ low-pressure end



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3.9 Tests and measurements performed with pressure gauge



Indicated on pressure gauge

1 - Temperature scale for refrigerant R134a CF3– CH2F or CH2F– CF3

2 - Pressure scale

Note

Pressure can be measured in various units: 1 MPa (megapascal) is equivalent to 10 bar gauge pressure, or 145 psi; 1 bar absolute pressure is the same as 0 bar gauge pressure, which is roughly equivalent to atmospheric pressure.

In addition to the pressure scale, pressure gauges may have one or more temperature scales. The scale values for R134a are assigned according to the vapour pressure table. As different refrigerants develop different vapour pressures at the same temperature, each temperature scale is marked for the appropriate refrigerant.

- Pressure gauges permit the following test and measurement operations ⇒ page 80 .

3.9.1 Pressure gauges permit the following test and measurement operations

Refrigerant circuit pressure and temperature measurements

- The high-pressure gauge measures the pressure and temperature propagated evenly from the air conditioner compressor outlet via the condenser to the constriction (restrictor or expansion valve) when the air conditioning system is switched on.
- The low-pressure gauge measures the pressure and temperature propagated evenly from the constriction (restrictor or expansion valve) via the evaporator to the inlet of the air conditioner compressor when the air conditioning system is switched on.

Note

The relationship between pressure and temperature indicated on the pressure gauges only exists in a refrigerant circuit containing liquid or vapour, but not gas. In the gas state, the temperature is approx. 10 °C to 30 °C higher than the pressure gauge reading.

Detection of refrigerant in a closed vessel

Refrigerant R134a is present in a closed vessel or in the refrigerant circuit if the temperature indicated on the pressure gauge corresponds to the temperature of the refrigerant (standing liquid assumes ambient temperature).

A closed vessel or a deactivated refrigerant circuit is empty if the temperature indicated on the pressure gauge is below the temperature of the refrigerant.

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Note

The relationship between pressure and temperature indicated on the pressure gauges no longer applies if no liquid is present and the pressure is built up solely by gas.

3.10 Air conditioner service and recycling units

Air conditioner service units for the extraction, cleaning and transfer of refrigerant for motor vehicle air conditioning systems are currently available from various manufacturers.

Only certain air conditioner service stations (with appropriate additional equipment and various adapters if applicable) can be used for flushing the refrigerant circuit ⇒ page 115 .

- Classification of extraction systems ⇒ page 81
- Charging systems that do not require a permit ⇒ page 82

3.10.1 Classification of extraction systems

WARNING

When working on the refrigerant circuit and handling refrigerant, observe the generally valid safety precautions and pressure vessel regulations.

Note

- *The air conditioner service and recycling units used in motor vehicle workshops are extraction and charging systems that do not require a permit (Group „3“) but which should only be operated by qualified personnel. Instructions for the operation and service of the devices may be found in the respective manufacturer's documentation.*
- *Extraction and charging systems of groups „1“ and „2“ are not used in motor vehicle workshops.*

Group „3“ extraction and charging systems:

Mobile extraction and charging systems for filling compressed-gas vessels permanently connected to the system

The refrigerant or refrigerant/oil mixture is transferred to compressed-gas vessels which are permanently connected to the mobile systems. According to §3 Paragraph 5 No. 3 of the German pressure vessel regulations (different regulations may apply in other countries), compressed-gas vessels are classified as pressure vessels in this case.

The charging systems:

– Do not require a permit.

– Do not require expert testing, as the gas is transferred to compressed-gas vessels which are classed as being pressure vessels (by contrast, a permit is required for the system for filling compressed-gas vessels from these pressure vessels for transfer to other parties and testing is mandatory).

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3.10.2 Charging systems that do not require a permit

WARNING

When working on the refrigerant circuit and handling refrigerant, observe the generally valid safety precautions and pressure vessel regulations.

Charging systems not requiring a permit are ones used for transferring compressed gases to mobile compressed-gas vessels for internal use only.

Note:

Some air conditioner service units are charging systems not requiring a permit. When working with such equipment, the refrigerant is not transferred to mobile compressed-gas vessels, but rather into a permanently installed charging cylinder with visible level gauge and float switch.

Recommendation:

It is advisable to use a portable cylinder with visible level gauge and high-pressure safety valve for surplus refrigerant for internal use.

TRG 402 (technical regulations for compressed gases) must be observed when filling other compressed-gas vessels with compressed gases.

3.11 Repair notes for refrigerant circuit

WARNING

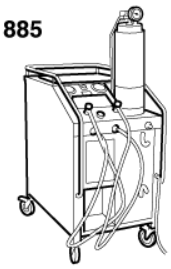
- ***When working on the refrigerant circuit, observe generally valid safety precautions and pressure vessel regulations.***

Special tools and accessories:

The performance of proper workmanlike repairs on an air conditioning system

- Requires the use of special tools and materials as listed on ⇒ page 314 .
- Requires compliance with the basic instructions for use of leak detectors ⇒ page 158 .
- Requires expert knowledge.

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Note

Releasing refrigerant into the environment is prohibited ⇒ page 83 (laws and regulations).

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4 Laws and regulations

Note

The laws and regulations listed below are valid in Germany. Other or additional laws and regulations may apply in other countries.

♦ Laws and regulations ⇒ page 83

4.1 Laws and regulations

Nowadays the effects of climate change can be seen throughout the world. Climate protection is thus one of the most important problems to be tackled. Solving this problem does however represent an enormous challenge for everybody.

One aspect of the Kyoto protocol is the definition of the worldwide climate protection targets. This protocol contains reduction targets both for carbon dioxide and fluorinated greenhouse gases, e.g. for the refrigerant R134a on account of the high greenhouse potential.

A number of laws of relevance to the automobile industry have been passed at European level for example. In Germany for example, the climate protection regulation on chemicals additionally came into force on 1st August 2008 to set down the European legislation more precisely.

- Regulation (EC) no. 2037/2000
- Regulation (EC) no. 842/2006
- Regulation (EC) no. 706/2007
- Regulation (EC) no. 307/2008
- Directive 2006/40/EC
- Climate protection regulation on chemicals, recycling and refuse law (for Germany).

Maintenance and repair work on air conditioner refrigerant circuits

Anyone performing maintenance and repair work on motor vehicle air conditioning systems must have received the relevant instruction or attended a training course and be able to furnish certification of the appropriate qualifications. Other or additional regulations may apply in countries outside the European Community.

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The following is however generally applicable:

Operation, maintenance, shutdown, obligation to accept return

- With regard to the operation, repair and shutdown of items containing refrigerants, it is prohibited to contravene the state of the art by allowing the substances contained in these to escape into the atmosphere.
- A record should be kept of the quantities used during operation and for maintenance work ⇒ Audi-ServiceNet, HSO Environmental Protection to be able to submit certification of use to the relevant authorities on request. According to a regulation of the European parliament from 2005, it is no longer necessary to keep a record sheet in the EC. Other regulations may apply in countries not belonging to the EC.
- Distributors of the substances and preparations listed in the above-mentioned regulations are obliged to take back such substances and preparations after use or to ensure that these are taken back by a third party appointed by the distributor.

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- The maintenance and shutdown of items containing refrigerants listed in the regulations mentioned as well as acceptance of return of the substances and preparations listed in these regulations may only be undertaken by persons with the necessary expert knowledge and technical equipment.

Criminal offences and infringements of the law

- An infringement in terms of the regulations and laws mentioned above is constituted by any wilful or negligent action during the operation, maintenance or shutdown of items containing the refrigerants mentioned which allows substances contained in these to escape into the atmosphere contrary to the state of the art or by the wilful or negligent contravention of the applicable regulations and laws mentioned above.

TRG (technical regulations for compressed gases) 400, 401, 402

Note

Only excerpts from the TRG are given in the following (sections applicable to motor vehicle manufacturers and workshops).

- TRG 400 (general regulations for charging systems)
  - Definition of terms and explanatory notes
  - Charging systems
  - Charging systems are systems for filling mobile compressed-gas vessels. The associated premises and facilities form part of the charging system.
  - Charging systems requiring a permit

Note

- *Charging systems requiring a permit are ones used to transfer compressed gases to mobile compressed-gas vessels for supplying to third parties.*
- *Charging systems not requiring a permit are ones used for transferring compressed gases to mobile compressed-gas vessels for internal use only.*

- TRG 401 (installation of charging systems)
  - Does not apply to vehicle manufacturers or workshops.
- TRG 402 (operation of charging systems)
  - Employees and the instruction of employees

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Note

Employees are to be given instruction on the following topics before beginning work and at regular, appropriate intervals, however at least once a year:

- Hazards specifically associated with handling compressed gases
- Safety regulations, particularly the applicable TRG
- Procedures in the event of malfunction, damage and accidents
- The use of fire-extinguishing and protective equipment

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- Operation and maintenance of the charging system on the basis of the instructions for use

– Charging systems may only be operated and maintained by persons:

– Aged 18 and above

– Possessing the necessary technical knowledge.

– Who can be relied upon to work diligently.

Note

Work under supervision may also be performed by persons who fail to comply with the above-mentioned prerequisites.

Charging (a special TRG applies to vessels from other countries and charging of these).

♦ A compressed-gas vessel is only to be filled with the compressed gas declared on it and the quantity must comply with the stipulated pressure, weight or volume data (refer to pressure vessel regulations).

♦ In the case of vessels approved for use with several types of compressed gas, the compressed gas with which it is to be filled and - if the compressed gas has a tc greater than/equal to -10 °C (tc = critical temperature) - the maximum permissible charging weight in line with TRG 104 must be marked on the vessel prior to connection for filling.

♦ Compressed-gas vessels marked with the maximum permissible charge pressure in bar at 15 °C must be filled manometrically. If, at the time of filling, the temperature is not 15 °C, the pressure corresponding to the prevailing temperature must be established; it must be ensured that the permissible charge pressure at 15 °C is not exceeded in the compressed-gas vessel. The charged vessels must be checked by way of random pressure measurements to determine possible overfilling.

♦ Compressed-gas vessels on which the maximum permissible capacity is indicated by the net weight (filling weight, permissible weight of fill) in kilograms must be filled gravimetrically. The vessels must be weighed during filling and subsequently subjected to a weight check on special scales to detect possible overfilling. Scales used for this purpose must be calibrated.

♦ Under certain conditions, gases with a tc greater than/equal to +70 °C may be transferred volumetrically from compressed-gas vessels with a maximum volume of 150 l to compressed-gas vessels with a volume of max. 1000 ccm. The stipulations of the TRG apply to filling workmen's cylinders with liquefied gas.

♦ The following TRG apply to vessels in vehicles:

– TRG 101 to gases with a tc greater than/equal to +70 °C.

– TRG 102 or TRG 103 to industrial gas mixtures with a tc greater than/equal to +70 °C:

– Liquefied extremely low-temperature compressed gases (refer to TRG 103) may also be filled volumetrically (with the exception of vessels in vehicles) if the charging system and/or the vessels is/are equipped with devices for measuring or limiting the volume of the charge and for measuring the temperature of the charge. When filling volumetrically, it must be ensured that the permissible charge weight indicated on the vessel is not exceeded. To determine possible overfilling, the

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charged vessels are to be checked gravimetrically on calibrated scales or volumetrically, provided that the compressed gases are not highly toxic. Volumetric checking requires the use of appropriate equipment with completely separate charging and checking devices.

- Charging and check measurements must be performed by different people. Check measurements must be performed immediately upon conclusion of the filling process.
- Overfilled vessels must be discharged immediately and safely until the permissible filling quantity is reached. The compressed-gas fill must then be determined again.
- Certain parts of the TRG do not apply or only apply to a limited extent to vessels for liquefied, extremely low-temperature compressed gases which are neither flammable nor toxic; this does not affect the provisions of road traffic legislation.
- When filling compressed gas vessels with liquified gases at charging temperatures less than/equal to -20 °C, the compressed gas vessel (if the vessel material has not been tested for temperatures less than/equal to -20 °C) is not to be released from the charging system for transportation until the vessel wall temperature is greater than/equal to +20 °C.

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Recycling and refuse law

- Regulations and rules for the handling and disposal of refrigerants and refrigerant oils can be found in the climate protection regulation on chemicals and in the recycling and refuse law (applicable in Germany, different regulations and rules may apply in other countries).

Disposal of refrigerant

Refrigerants intended for disposal are to be transferred to marked recycling containers, observing the permissible filling quantity. In Germany, reference should be made for example to the climate protection regulation on chemicals and the recycling and refuse law (different regulations and rules may apply in other countries).

Disposal of refrigerant oil

Used refrigerant oils from systems employing halogenated hydrocarbons are to be disposed of as waste requiring special monitoring. They are not to be mixed with other oils or substances. Proper storage and disposal must be ensured in line with local regulations. In Germany, reference should be made for example to the climate protection regulation on chemicals and the recycling and refuse law (different regulations and rules may apply in other countries) ⇒ Audi-ServiceNet, HSO Environmental Protection .

- Conversion of an R12 refrigerant circuit to an R134a refrigerant circuit and servicing (retrofit) ⇒ page 87
- Keeping refrigerant records ⇒ page 87

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4.1.1 Conversion of an R12 refrigerant circuit to an R134a refrigerant circuit and servicing (retrofit)

Note

- *For environmental reasons and on account of the corresponding legislation, refrigerant R12 can no longer be manufactured or supplied. Refrigerant R134a has been developed as a replacement for R12.*
- *However, air conditioning systems developed and designed for refrigerant R12 cannot simply be charged with refrigerant R134a. To ensure trouble-free operation of the air conditioning system even after conversion, various components of the refrigerant circuit must be renewed.*
- *A precise description of the conversion procedure and information on the servicing of converted refrigerant circuits can be found in ⇒ Workshop Manual: Air conditioner with refrigerant R12 Parts 2 and 3 (this Workshop Manual is only available in hardcopy form).*

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4.1.2 Keeping refrigerant records

The environmental statistics law requires records to be kept on the use of refrigerants exceeding a certain quantity per year.

Consequently, motor vehicle workshops may well have to provide the relevant local authorities with information on their use of refrigerant. It is therefore advisable to always keep a record sheet ⇒ Audi-ServiceNet, HSO Environmental Protection .

Note

- *On the basis of a regulation of the European parliament from 2005, it is generally no longer necessary in the EC to keep a record sheet for the quantity of refrigerant handled in motor vehicle workshops. A record sheet is currently only necessary as of an annual consumption of 50 kg or more (refer also to directive (EC) No. 1005/2009 for example).*
- *As the relevant local authorities may demand information on refrigerant consumption as of a certain quantity (currently as of 20 kg per year), it is advisable to always keep an appropriate record sheet.*
- *Other regulations may apply in countries not belonging to the EC.*

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5 Refrigerant circuit

- Important repair notes for air conditioning systems ⇒ page 88
- Conversion of refrigerant circuits from refrigerant R12 to R134a ⇒ page 88 .
- Working with the air conditioner service station ⇒ page 88 .
- Blowing out the refrigerant circuit with compressed air and nitrogen ⇒ page 106 .
- Flushing (cleaning) the refrigerant circuit with refrigerant R134a ⇒ page 115 .
- Determination of refrigerant circuit leaks ⇒ page 158 .

5.1 Important repair notes for air conditioning systems

- Air conditioners for refrigerant R12 may only be filled with refrigerant R134a if certain prerequisites are satisfied ⇒ page 87 and ⇒ Workshop Manual: Air conditioner with refrigerant R12 Part 2 and 3 . This Workshop Manual is only available in hardcopy form.
- The refrigerant oils specifically developed for R134a and R12 refrigerant circuits are never to be mixed.
- Air conditioner service stations which come into contact with the refrigerant should only be used for the intended refrigerant.
- The components of an R134a refrigerant circuit are accordingly labelled, marked with green stickers or designed (e.g. a different thread) such that interchange with components for refrigerant R12 is not possible.
- The refrigerant being used is indicated by a label affixed to the lock carrier in the engine compartment or in the plenum chamber.
- Never mix various refrigerants.

Note

When working on the refrigerant circuit, always pay attention the information given in the Sections on „Safety measures“ ⇒ page 24 and „Basic rules for working on refrigerant circuit“ ⇒ page 29 .

5.2 Converting refrigerant circuits from refrigerant R12 to refrigerant R134a

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CFC refrigerants are no longer used in the automotive industry.

For conversion of refrigerant circuits from R12 to R134a and servicing converted circuits, refer to

⇒ Workshop Manual: Air conditioner with refrigerant R12 Parts 2 and 3 (this Workshop Manual is only available in hardcopy form).

5.3 Working with the air conditioner service station

Vehicles with high-voltage system (hybrid vehicles)

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-

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voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

WARNING

Working on vehicles with high-voltage wiring:

- *Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.*
- *High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.*
- *The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.*

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DANGER!

Risk of fatal injury if high-voltage components are damaged.

Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

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If work is necessary in the vicinity of high-voltage system components, perform a visual inspection of the high-voltage components and wiring to check for damage ⇒ page 6 and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

If work is necessary on high-voltage system components, de-energise the high-voltage system ⇒ Electrical system; Rep. gr. 93 ; De-energising high-voltage system and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

Note

When working on the refrigerant circuit using the air conditioner service station, the high-voltage system does not usually have to be de-energised.

De-energising high-voltage system

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DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be de-energised by a suitably qualified person (Audi high-voltage technician).*
- *It must be definitely confirmed that the high-voltage system is de-energised. The system may only be de-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The qualified person (Audi high-voltage technician) confirms that the system is de-energised and uses the locking cap -T40262- to ensure that the system cannot be re-energised. The ignition key and the maintenance connector for high-voltage system - TW - should then be stored in a safe place by the qualified person.*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

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Note

- *De-energising high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - De-energise high-voltage system (Rep. gr. 93)`

Re-energising high-voltage system

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DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be re-energised by a suitably qualified person (Audi high-voltage technician).*
- *The system may only be re-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The vehicle is then made ready for operation again by the qualified person (Audi high-voltage technician).*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

Note

- *Re-energise high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
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DANGER!

When working on a vehicle with the ignition switched on or while the drive system is active, the engine can start unexpectedly and exhaust fumes can cause a health hazard in closed rooms. Moving parts can trap or draw in parts of the body and/or clothing (safety hazard).

Before switching on the ignition, perform the following steps:

- *Move selector lever to position P*
- *Activate parking brake*
- *Switch off ignition*
- *Open bonnet*
- *Connect battery charger (e.g. -VAS 5095A-) to jump-start connections of 12 V electrical system*
- *Switch on ignition*

– To minimise the number of automatic engine starts when the vehicle's drive system is active during test and measurement work, charge the vehicle batteries e.g. with the battery charger 60A -VAS 5904- in battery standby mode ⇒ Electrical system; Rep. gr. 27 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

– For test and measurement work that requires the vehicle's drive system to be active or the ignition to be switched on, move the selector lever to position „P“, activate the parking brake and arrange the tools needed so that they cannot come into contact with moving components of the engine and so that they cannot even come near to components that turn when the engine is running.

Note

- *Move the selector lever to position „P“ and activate the parking brake before performing test and measurement work for which the ignition must be switched on but where the vehicle's drive system does not need to be active.*
- *The status of the drive system is shown by the control unit in dash panel insert -J285- via the „power meter“ ⇒ Owner's Manual .*
- *Activating and deactivating drive system ⇒ Owner's Manual (note display of control unit in dash panel insert -J285-).*

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Vehicles with start/stop system

WARNING

Injury risk due to automatic engine start (vehicles with start/stop system).

- *On vehicles with an activated start/stop system (indicated by a message in the instrument cluster display), the engine may start automatically on demand.*
- *Therefore, please make sure that the start/stop system is deactivated when performing repair work on the vehicle (switch off the ignition, and switch it on again if required).*

All vehicles

Caution

- *If there is a possibility that chemical substances (sealing additives) for sealing leaks have been added to the refrigerant circuit from which the refrigerant is to be extracted, do not connect the air conditioner service station to this refrigerant circuit and do not extract the refrigerant.*
- *Chemical substances (sealing additives) for sealing leaks form deposits in the refrigerant circuit which will impair operation of the air conditioning system and lead to failure of the system (and of the air conditioner service station).*
- *Customers should be informed that the air conditioner in their vehicle contains substances not approved by Audi and that the system can therefore not be discharged and serviced by your workshop.*

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Note

- *Commercially available chemical substances (sealing additives) for sealing refrigerant circuit leaks are not approved by Audi AG. Damage to or malfunctioning of the air conditioner or air conditioner service station cannot be precluded as no tests have been performed to establish long-term action, effectiveness and material compatibility.*
- *Commercially available sealing additives have different physical and chemical properties. They may have a lasting detrimental effect on operation of the air conditioner and air conditioner service station or even be the cause of total failure.*
- *Audi does not permit the use of chemical substances (sealing additives) to seal leaks in the refrigerant circuit.*
- *Chemical substances (sealing additives) for sealing leaks in the refrigerant circuit generally react with the ambient air or the humidity contained in it. They cause malfunctioning of valves and other components with which they come into contact on account of deposits in the refrigerant circuit (and in the air conditioner service station being used). These deposits cannot be completely removed from the components (even by flushing).*
- *Chemical substances (sealing additives) for sealing leaks in the refrigerant circuit are normally not outwardly apparent and the identification stickers which should be affixed are usually non-existent. Vehicles with an unknown history should therefore be treated with due caution.*
- *On the accessories market, vessels with integrated filters are available which are supposed to intercept these chemical substances (additives used to seal leaks). As Audi are not aware of the composition and thus the physical and chemical properties of these substances, no information can be given here as to the effectiveness and the separation rate of such filters.*
- *The sealant filter -VAS 6592- available as "Workshop equipment" provides a certain degree of protection for air conditioner service stations. This filter is incorporated between the air conditioner service station and the service connection on the low-pressure end of the vehicle refrigerant circuit (the air conditioner service station is not to be attached to the service connection on the high-pressure end of the refrigerant circuit for drainage, evacuation and measurement). The filter separates out certain substances added to the circuit to seal refrigerant circuit leaks. It thus prevents the unimpeded and unrestricted ingress of these substances into the air conditioner service station (together with the refrigerant and refrigerant oil) where they would cause damage. Protection is however only provided if the built-in filter is renewed at regular intervals exactly as specified by the manufacturer in the applicable instructions. As Audi do not approve the use of chemical substances (sealing additives) for sealing leaks in the refrigerant circuit and the composition of such chemical substances (sealing additives) marketed for example as so-called „refrigerant circuit sealants“ varies greatly, it is again not possible to provide any information on the action and efficiency of the sealant filter -VAS 6592- .*

If air conditioner refrigerant circuit repair work has to be performed on a vehicle on which chemical substances (sealing additives) have been added to the refrigerant circuit to seal leaking components (or even if this is just strongly suspected), the customer (vehicle owner) is to be made aware of the following:

- The air conditioner refrigerant cannot be extracted on account of the substances added (sealing additives), as these could

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damage the air conditioner service station. The refrigerant must be extracted for example by a company authorised to extract and then dispose of the contaminated refrigerant using the appropriate equipment (e.g. a local refuse disposal company specialising in the disposal of refrigerants).

- The air conditioner can only be properly repaired by renewing all the refrigerant circuit components which have come into contact with the sealing additive. The sealing additive may already have damaged certain refrigerant circuit components (e.g. the air conditioner compressor regulating valve -N280-) or lead to damage and subsequent failure shortly after renewed start-up. Furthermore, sealing additive deposits may subsequently work loose in the refrigerant circuit components and then lead to renewed failure of the air conditioner (complete cleaning of these components with workshop equipment is not possible at present).

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Work on the air conditioner refrigerant circuit

- Important notes for working with the air conditioner service station ⇒ page 96 .
- Connection of the air conditioner service station for measurement and testing ⇒ page 97 .
- Refrigerant circuit discharge using the air conditioner service station ⇒ page 98 .
- Evacuate refrigerant circuit with air conditioner service station ⇒ page 99 .
- Refrigerant circuit charging using the air conditioner service station ⇒ page 103 .
- Air conditioner start-up after charging ⇒ page 104 .
- Pouring refrigerant into the charging cylinder or storage vessel of the air conditioner service station ⇒ page 105 .
- Air conditioner service station drainage ⇒ page 106 .

5.3.1 Important notes for working with the air conditioner service station

Observe the following with regard to the operation of air conditioner service stations (e.g. V.A.G 1885; for currently available air conditioner service stations, refer to ⇒ V.A.G Workshop equipment catalogue):

– The fitted filter and dryer must be renewed at the latest when the operational time specified in the related operating instructions has been reached.

– If an air conditioner service station is also used to flush the refrigerant circuit, the dryers and filters fitted must be renewed more frequently ⇒ page 106 .

– Use is only to be made of refrigerant oils which are also approved for the vehicle-specific refrigerant circuit (if applicable, add the refrigerant oil directly to the refrigerant circuit). ⇒ Electronic parts catalogue

In cases of doubt about the composition of the refrigerant extracted from the refrigerant circuit, this is not to be re-used even after cleaning in the air conditioner service station.

– In such cases, the air conditioner service station is to be drained ⇒ page 179 , the system cleaned if necessary and the filters, dryers and refrigerant oil renewed.

– In Germany, for example, contaminated refrigerant can be returned to the refrigerant supplier in so-called recycling con-

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tainers for recycling or ecological disposal (other or additional regulations may apply in other countries).

Commercially available air conditioner service stations can be classified in 2 groups:

- Air conditioner service stations which clean the refrigerant extracted from a vehicle for re-use (so-called extraction and recycling stations), e.g. V.A.G 1885 (for currently available air conditioner service stations, refer to ⇒ V.A.G workshop equipment catalogue).
- Air conditioner service stations which transfer extracted refrigerant to recycling containers (for large-scale recycling); these are referred to as extraction systems.

5.3.2 Connecting air conditioner service station for measuring and testing

- Work procedure may vary depending on the type of tools selected; therefore it is important to observe the tool-specific operating instructions.

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Note

The work procedure must always be performed as described in the operating instructions of the air conditioner service station.

To prevent air or moisture entering the refrigerant circuit through the charging hoses, these are to be connected as follows:

– Switch off ignition.

– Connect air conditioner service station to power supply.

– Unscrew the sealing caps from the service connections or the connections with valve (refer to vehicle-specific refrigerant circuit) ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

– Evacuate the charging hoses if necessary.

– Connect quick-release coupling to service connection of refrigerant circuit.

WARNING

- ***Do not open the valves on the low or high-pressure end with the engine running, as otherwise the air conditioner compressor or the air conditioner service station could be destroyed by a short circuit between the high and low-pressure ends of the refrigerant circuit if the air conditioning system is switched on.***

– Only screw the handwheel into the quick-release coupling adapter to the extent required to reliably open the valve in the service connection (observe the pressure gauge; take care not to open the valve too far).

– Start the engine and perform the intended tests and measurements.

– Compare the values determined to the specified measured values ⇒ page 188 .

– Before detaching the quick-release coupling, close it by screwing out the handwheel.

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Vehicles with one service connection only:

Note

Screw the valve adapters -V.A.G 1785/9- , -V.A.G 1785/10- or the adapter set -V.A.G 1786- to the refrigerant circuit connections with valve and bleed the charging hoses during connection to the adapters (only a faintly audible escape of refrigerant gas is permitted) ⇒ page 179 .

– The charging hose must be fitted with a valve opener to open the valve in the valve adapter.

5.3.3 Discharging refrigerant circuit with air conditioner service station

- Work procedure may vary depending on the type of tools selected; it is therefore important to observe the tool-specific operating instructions.
- The refrigerant circuit must be discharged if you intend to remove parts of the refrigerant circuit, if there is any doubt about the quantity of refrigerant in the circuit or if safety precautions require you to do so.
- All the necessary usage information for working with the refrigerant air conditioner service station can be found in the air conditioner service station operating instructions.

Discharging:

– Switch off ignition.

– Connect the air conditioner service station in line with the operating instructions to the vehicle service connections (refer to vehicle-specific refrigerant circuit) and start up the service station ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

– Drain the refrigerant circuit with the air conditioner service station in line with the corresponding operating instructions.

Caution

Risk of air conditioner compressor damage if the refrigerant circuit is empty

Never start the engine when the refrigerant circuit is empty

- ***Depending on the version of the air conditioner service station, the pressure in the refrigerant circuit may be less than 1 bar absolute following drainage.***
- ***Depending on the version, the air conditioner compressor may be damaged by running it when the pressure in the refrigerant circuit is low***
- ***Never start the engine if the pressure in the refrigerant circuit is below ambient pressure***

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Note

- *There is a possibility of refrigerant oil being extracted from the refrigerant circuit together with the refrigerant. To ensure air conditioner compressor lubrication, the refrigerant oil in the circuit must be topped up with fresh oil ⇒ page 265 .*
- *On vehicles fitted with an air conditioner compressor with no magnetic clutch (with an air conditioner compressor regulating valve -N280-), the engine should not be run for longer than absolutely necessary with the refrigerant circuit empty and high engine speeds are to be avoided (constant air conditioner compressor operation).*
- *On vehicles with an air conditioner compressor with no magnetic clutch, the engine is only to be started following complete assembly of the refrigerant circuit (avoid high engine speeds).*
- *Depending on the version of the air conditioner compressor, the high-pressure end of the air conditioner compressor may be fitted with a valve to prevent the backflow of liquid refrigerant into the compressor after switching off the air conditioning system. If an air conditioner compressor with this valve is fitted on a vehicle with a refrigerant circuit with an expansion valve, a relatively long period may elapse before the pressure on the high-pressure end decreases (the expansion valve is cold and the pressure on the low-pressure end increases rapidly after switch-off, the expansion valve closes and the refrigerant can only flow slowly to the low-pressure end). If the air conditioner compressor is switched on (or the refrigerant circuit is discharged via the low-pressure end), the pressure on the low-pressure end decreases, the expansion valve opens and the refrigerant can flow to the low-pressure end.*

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If, after drainage, work not requiring the air conditioner service station is to be performed on the vehicle,

– disconnect the air conditioner service station from the refrigerant circuit and switch it off.

If, after drainage, the refrigerant circuit is to be evacuated and recharged, refer to ⇒ page 103 .

5.3.4 Evacuating refrigerant circuit with air conditioner service station

- The work procedure must always be performed as described in the operating instructions of the air conditioner service station.
- Quantity of refrigerant oil in refrigerant circuit checked and if necessary corrected ⇒ page 265 .
- Quantity of refrigerant in air conditioner service station checked

The refrigerant circuit must be evacuated before it is filled with refrigerant. In addition, moisture is removed from the circuit.

Leaks can be detected on evacuating the refrigerant circuit.

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Evacuating:

Caution

- *Do not start the engine during the evacuating procedure and while there is a vacuum in the refrigerant circuit.*
- *The air conditioner compressor may be damaged if the engine is started whilst there is a vacuum in the refrigerant circuit.*
- *Always charge the refrigerant circuit before starting the engine.*

– Switch off ignition.

– Connect air conditioner service station to power supply.

– Connect the charging hoses of the air conditioner service station to the vehicle refrigerant circuit with quick-release coupling adapters (refer to vehicle-specific refrigerant circuit) ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

– Screw in the handwheel of the quick-release coupling adapters to the extent required to reliably open the valves of the service connections (take care not to open the valve too far).

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Note

If you intend to measured the pressure on only one side of the refrigerant circuit after charging the system (on vehicles with a service connection), use the valve adapter and filler hose with valve opener ⇒ page 179 *.*

– Switch on air conditioner service station and evacuate refrigerant circuit for at least 30 minutes. In this process, the pressure reading must be less than 10 mbar absolute (corresponding to a vacuum of 990 mbar).

Note

On the air conditioner service station V.A.G 1885 (for currently available air conditioner service stations, refer to ⇒ V.A.G workshop equipment catalogue), the two green LEDs light at this pressure for example.

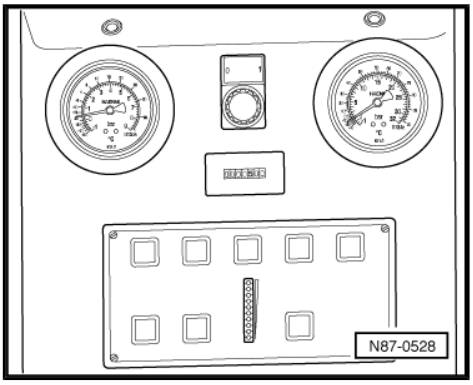
– Switch off the air conditioner service station and allow to stand for at least 1 hour.

- If the vacuum display (LED chain) does not change, the system is free of leaks and can be charged.

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Note

- *With V.A.G 1885 for example (for currently available air conditioner service stations, refer to ⇒ V.A.G workshop equipment catalogue), a current vacuum display (LED) is only obtained after pressing the Evacuation button again.*
- *If, with this air conditioner service station, the upper (green) LEDs do not light immediately after switching on, either the refrigerant circuit is leaking or there is still residual moisture/ refrigerant in the circuit.*



Proceed as follows if the vacuum is not maintained or an adequate vacuum cannot be generated:

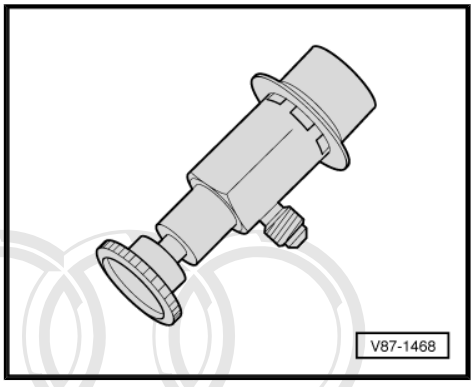
- The pressure in the refrigerant circuit only increases slowly following evacuation, e.g. due to the evaporation of refrigerant from the refrigeration oil.

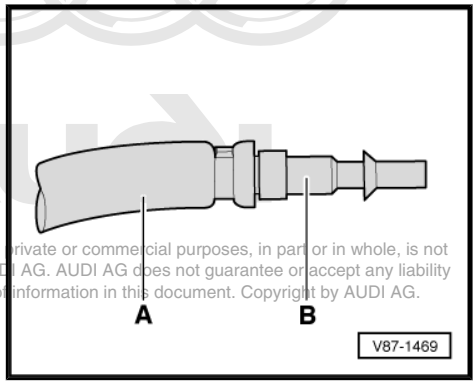
– If it is not certain whether the refrigerant circuit is really leakproof, repeat evacuation and observe the vacuum display over a lengthy period. Charging can only be performed once the vacuum is maintained.

– It it is certain that there are no leaks in the refrigerant circuit, charging can be performed.

- In the event of a leak of such a magnitude that the ingress of air on evacuation is already sufficient to prevent the air conditioner service station generating an adequate vacuum or the vacuum gauge already indicates the ingress of air and the loss of vacuum immediately after switching off the air conditioner service station.

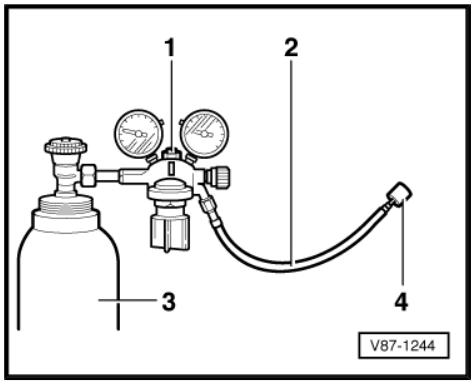
– Determine the leakage location in the refrigerant circuit as follows:





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Note

- *A major leak can be determined for example by building up a pressure of max. 15 bar in the refrigerant circuit with pure, dry compressed air or with nitrogen ⇒ page 106 . If the leak is of sufficient magnitude, the leakage location will be revealed by the noise of the gas escaping.*
- *Apply the compressed air or the nitrogen to the closed refrigerant circuit by way of the service connection to which a quick-release coupling adapter for service connections has been attached.*
- *The quick-release coupling adapter for service connections can be connected to the workshop compressed air system using for example a modified charging hose -A- (e.g. with a 5/8"-18 UNF thread, depending on the thread at the quick-release coupling adapter) and an appropriate adapter -B- ⇒ page 320 . To prevent the ingress of moisture, oil and dirt from the workshop compressed air system into the air conditioner refrigerant circuit, additional use is to be made for example of a combined fine filter unit for compressed air systems (oil, dirt and water separator as used for painting facilities), which is to be fitted between the compressed air system and the charging hose -A- ⇒ Workshop equipment catalogue .*
- *Using a pressure gauge set with nitrogen pressure reducer -1- (max. reducing pressure: 15 bar), a compressed-gas cylinder -3- filled with nitrogen can be connected to the service connection (quick-release coupling adapter for service connections attached) at the closed refrigerant circuit ⇒ page 319 with a charging hose -2- (e.g. with a 5/8"-18 UNF thread).*

– Slowly increase the pressure in the refrigerant circuit to max. 15 bar.

WARNING

- ***There may be an uncontrolled flow of nitrogen out of the cylinder.***
- ***Always work with pressure reducers for nitrogen cylinders (max. working pressure 15 bar).***
- ***For leak detection with nitrogen (max. permissible operating pressure 15 bar) always work with pressure reducers for nitrogen cylinders.***
- ***Use appropriate extraction units to draw off the gas mixture escaping from the components.***

– Determine the leakage location by way of the noise caused by the escaping gas at this point.

– Eliminate the leakage.

– Evacuate again and observe the vacuum display over a period of hours. Charging can only be performed once the vacuum is maintained.

- In the event of a leakage of a magnitude permitting the ingress of no or very little air and the air conditioner service station can generate an adequate vacuum. The vacuum display does not increase or only increases very slowly after switching off the air conditioner service station, indicating that air is only ingressing and vacuum is being lost through a minor leak.

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– Pour 100 g of refrigerant into the circuit and use an electronic leak detector to locate and eliminate any leak ⇒ page 164 or pour in refrigerant with UV contrast medium and use the leak detection system VAS 6201 to search for and eliminate the leak in the refrigerant circuit ⇒ page 165 .
– Discharge the refrigerant circuit if necessary ⇒ page 98 .
– Evacuate the refrigerant circuit and observe the vacuum display again over a period of hours. Charging can only be performed once the vacuum is maintained.

5.3.5 Charging refrigerant circuit with air conditioner service station

Note

The entire refrigerant charge can be added to either the high or low-pressure end ⇒ page 265 .

- The work procedure must always be performed as described in the operating instructions of the air conditioner service station.
- Before pouring in refrigerant, correct the quantity of refrigerant oil ⇒ page 265 .
- When charging the refrigerant circuit, the air conditioner service station must be on the same level as the vehicle in which the refrigerant circuit is to be charged (maximum difference 50 cm). Depending on the design of the air conditioner service station , an excessive difference in height could lead to differences between the quantity of refrigerant displayed and that actually poured in. The filling accuracy of the air conditioner service station may vary.

– Switch off ignition.
– Evacuate refrigerant circuit with air conditioner service station ⇒ page 99 .
– Unscrew handwheel at quick-release coupling adapter (to close it).
– Allow refrigerant to flow into filler hose.
– Take the charging cylinder reading.
– Screw in handwheel at quick-release coupling adapter (to open it) and charge with the specified quantity of refrigerant.
– Switch off air conditioner service station.

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5.3.6 Starting up air conditioner after charging

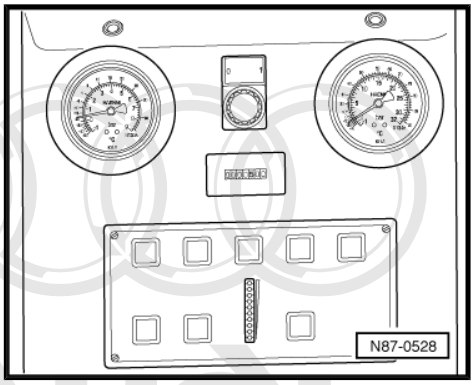
Note

- *If it has been removed, give the mechanically driven air conditioner compressor approx. 10 turns by hand prior to initial start-up (on or after installation, e.g. before fitting the belt) to prevent damage caused by fluid lock when first switched on (any oil in the air conditioner compressor cylinder is forced out by the cranking action).*
- *If it has been removed, the electrically driven air conditioner compressor is to be started up, prior to initial commissioning of the air conditioner and following charging, by way of the „Basic setting, compressor run-in" function of the Guided Fault Finding routine ⇒ Vehicle diagnostic tester, „Guided Fault Finding" function for air conditioner and battery regulation . This guards the air conditioner compressor against damage caused for example by fluid lock when first switched on (any oil in the combustion chamber of the air conditioner compressor is forced out).*
- *The mechanically driven air conditioner compressor is driven via a belt or shaft by the engine. The electrically driven air conditioner compressor is driven via an electric motor attached directly to the air conditioner compressor (e.g. on vehicles with hybrid drive).*

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Start-up of air conditioner with mechanically driven air conditioner compressor



- Start the engine with the air conditioner compressor switched off (version with magnetic clutch).
- Set the air conditioner compressor to minimum output, "Econ" or A/C off mode (version with no magnetic clutch with a regulating valve).
- Wait for the idling speed to stabilize.
- Switch on the air conditioner compressor and operate the system for at least 2 minutes at idling speed.
- If necessary, check the pressures in the refrigerant circuit with the air conditioner service station.
- Switch off engine.
- Screw out the handwheel on the quick-release coupling adapter.
- Detach the charging hoses from the refrigerant circuit.
- Screw the sealing caps back on.

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Start-up of air conditioner with electrically driven air conditioner compressor

- The air conditioner compressor is to be started up by way of the Guided Fault Finding „Basic setting, compressor run-in“ function ⇒ Vehicle diagnostic tester function „Guided Fault Finding“ for air conditioner and battery control
- If necessary, check the pressures in the refrigerant circuit with the air conditioner service station on completion of basic setting.
- Screw out the handwheel on the quick-release coupling adapter.
- Detach the charging hoses from the refrigerant circuit.
- Screw the sealing caps back on.

5.3.7 Pouring refrigerant into reservoir (charging cylinder or storage vessel) of air conditioner service station

- The work procedure must always be performed as described in the operating instructions of the air conditioner service station.
- A certain quantity of refrigerant is specified as charge for each air conditioning system. To ensure that neither too much nor too little refrigerant is added (either would reduce the cooling output), the charging cylinder has a scale indicating the weight for example.
- The volume of a refrigerant changes as a function of pressure. The scale must therefore be set according to the pressure in the charging cylinder.

Note

Do not completely empty the charging cylinder or storage vessel, as the liquid column boundary layer cannot be traced in the indicator tube during filling (outside visible range).

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WARNING

Do not overfill. A completely filled charging cylinder or storage vessel will explode when the temperature rises.

5.3.8 Discharging air conditioner service station

Note

- *If it is necessary to drain the air conditioner service station (e.g. due to extraction of contaminated refrigerant), all filters and dryers must always be renewed (do not remove filter and dryer from the air-tight packaging until immediately before installation to minimise moisture absorption).*
- *Refrigerant containers filled with contaminated used refrigerant are referred to as „Recycling containers“.*
- *Always evacuate recycling containers prior to initial filling with refrigerant (if there is air in a refrigerant container it is not to be filled with refrigerant).*
- *Do not mix various types of refrigerant (refrigerant mixtures cannot be recycled and must be disposed of). If there is any doubt about the composition of the contents of the container, the refrigerant recycling company must be informed.*

Caution

- ***When filling recycling containers (compressed-gas vessels), observe the applicable regulations, technical rules and laws.***
- ***Recycling containers must never be overfilled. The gas cushion in overfilled recycling containers is not sufficient to absorb the liquid expansion caused by the influence of heat. There is a risk of rupturing.***
- ***To ensure safety, make exclusive use of recycling containers fitted with a safety valve.***
- ***Recycling containers must be weighed on calibrated scales during the filling process. The maximum permissible capacity is 75 % (charge factor 0.75) of the charge weight indicated on the recycling container (the possibility of refrigerant oil entering the recycling container along with the refrigerant cannot be ruled out).***

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5.4 Blowing out refrigerant circuit with compressed air and nitrogen

Vehicles with high-voltage system (hybrid vehicles)

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

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WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

WARNING

Working on vehicles with high-voltage wiring:

- *Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.*
- *High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.*
- *The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.*

DANGER!

Risk of fatal injury if high-voltage components are damaged.

Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

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If work is necessary in the vicinity of high-voltage system components, perform a visual inspection of the high-voltage components and wiring to check for damage ⇒ page 6 and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

If work is necessary on high-voltage system components, de-energise the high-voltage system ⇒ Electrical system; Rep. gr. 93 ; De-energising high-voltage system and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

De-energising high-voltage system

DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be de-energised by a suitably qualified person (Audi high-voltage technician).*
- *It must be definitely confirmed that the high-voltage system is de-energised. The system may only be de-energised using the vehicle diagnostic tester via „Guided Fault Finding“.*
- *The qualified person (Audi high-voltage technician) confirms that the system is de-energised and uses the locking cap -T40262- to ensure that the system cannot be re-energised. The ignition key and the maintenance connector for high-voltage system - TW - should then be stored in a safe place by the qualified person.*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

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Note

- *De-energising high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - De-energise high-voltage system (Rep. gr. 93)`

Re-energising high-voltage system

DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- ***Voltage levels in the high-voltage system constitute a safety hazard.***
- ***For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.***
- ***The high-voltage system may only be re-energised by a suitably qualified person (Audi high-voltage technician).***
- ***The system may only be re-energised using the vehicle diagnostic tester via „Guided Fault Finding".***
- ***The vehicle is then made ready for operation again by the qualified person (Audi high-voltage technician).***
- ***The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.***

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Note

- *Re-energise high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - Re-energise high-voltage system (Rep. gr. 93)`

DANGER!

When working on a vehicle with the ignition switched on or while the drive system is active, the engine can start unexpectedly and exhaust fumes can cause a health hazard in closed rooms. Moving parts can trap or draw in parts of the body and/or clothing (safety hazard).

Before switching on the ignition, perform the following steps:

- ***Move selector lever to position P***
- ***Activate parking brake***
- ***Switch off ignition***
- ***Open bonnet***
- ***Connect battery charger (e.g. -VAS 5095A-) to jump-start connections of 12 V electrical system***
- ***Switch on ignition***

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– To minimise the number of automatic engine starts when the vehicle's drive system is active during test and measurement work, charge the vehicle batteries e.g. with the battery charger 60A -VAS 5904- in battery standby mode ⇒ Electrical system; Rep. gr. 27 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

– For test and measurement work that requires the vehicle's drive system to be active or the ignition to be switched on, move the selector lever to position „P“, activate the parking brake and arrange the tools needed so that they cannot come into contact with moving components of the engine and so that they cannot even come near to components that turn when the engine is running.

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Note

- *Move the selector lever to position „P“ and activate the parking brake before performing test and measurement work for which the ignition must be switched on but where the vehicle's drive system does not need to be active.*
- *The status of the drive system is shown by the control unit in dash panel insert -J285- via the „power meter“ ⇒ Owner's Manual .*
- *Activating and deactivating drive system ⇒ Owner's Manual (note display of control unit in dash panel insert -J285-).*

All vehicles

The best way of removing moisture, impurities and old refrigerant oil from the refrigerant circuit without any unnecessary loss of refrigerant and without extensive assembly work, whilst at the same time ensuring environmental compatibility, is to flush the refrigerant circuit with refrigerant R134a or to blow it out with compressed air and nitrogen.

Note

- *Blowing out the refrigerant circuit with compressed air and nitrogen usually involves far more work than flushing with refrigerant R134a. Flushing with refrigerant R134a also provides far better cleaning of the components. Flushing should therefore always be employed in the event of complaints (blowing out should only be applied when dealing with certain problems and for particular components).*
- *Under certain conditions it may, for example, be sufficient to blow out specific components (e.g. individual refrigerant pipes or refrigerant hoses) with compressed air and nitrogen (for instance to force old refrigerant oil out of individual components following removal).*
- *Certain impurities are impossible or difficult to remove properly from the refrigerant circuit using compressed air. Such impurities can be removed for example by flushing with refrigerant R134a ⇒ page 115 .*
- *A maximum working pressure of 15 bar is not to be exceeded when blowing out (corresponds to the pressure prevailing in a charged refrigerant circuit at an ambient temperature of approx. 60 °C; use pressure reducer for compressed air as well if applicable).*

WARNING

- ***Nitrogen can escape from the bottle in an uncontrolled way.***
- ***Only use pressure reducer for nitrogen cylinders (max. working pressure 15 bar).***
- ***Use appropriate extraction units to draw off the gas mixture escaping from the components.***

– Always flush or blow out components in the direction opposite to refrigerant flow.

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Note

The restrictor, expansion valve, air conditioner compressor, receiver and reservoir cannot be flushed with compressed air and nitrogen.

– In the case of condensers fitted with a dryer cartridge in the integrated receiver, this cartridge is to be removed.

Note

- *In the case of condensers with an integrated receiver / dryer cartridge which cannot be renewed separately, the condenser is to be renewed after flushing.*
- *Depending on the version, receivers on which the dryer cartridge can be renewed separately may be provided with an additional filter element which may have to be renewed together with the dryer cartridge.*

– First flush out the old refrigerant oil and dirt with compressed air and then use nitrogen to remove the moisture from the components.

– For adapter for connecting pressure hose to refrigerant circuit, refer to ⇒ page 179 .

Observe the following to prevent oil and moisture from the compressed-air system from ingressing into the refrigerant circuit.

– The compressed air must be passed through a compressed-air purifier for cleaning and drying. Use is therefore to be made of filters and dryers for compressed air (included in the scope of delivery as tool for painting work) ⇒ Workshop equipment and special tools catalogue .

– For refrigerant lines with a thread or union nut at the connection, make use of adapters from the adapter set for refrigerant circuit -V.A.G 1785- (adapter -V.A.G 1785/1- to adapter -V.A.G 1785/8-) for connection of the 5/8" -18 UNF charging hoses (some of these adapters are also contained in the VW/Audi passenger vehicle adapter set -VAS 6338/1-).

– For refrigerant pipes with no thread or union nut at connection (for connecting adapters), use adapters from adapter set for refrigerant circuits -VAS 6338/1- or commercially available blow-out gun with rubber mouthpiece.

Note

- *The refrigerant circuit is only to be blown out with compressed air and then nitrogen if no means of flushing the refrigerant circuit are available or if flushing of individual components would involve too much work (blowing minor impurities and small quantities of moisture out of refrigerant lines for example is not particularly time-consuming).*
- *Compressed air/nitrogen emerging from the components is to be drawn off by way of an appropriate system (e.g. workshop extraction system).*

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The refrigerant circuit (or individual components) is/are to be blown out if no means of flushing are available or if flushing seems inappropriate

- In the event of dirt or other impurities in individual circuit components.
- If the vacuum reading is not maintained on evacuating a leak-free refrigerant circuit (pressure build-up due to moisture in refrigerant circuit).
- If the refrigerant circuit has been left open for longer than the normal assembly time (e.g. following an accident).
- If pressure and temperature measurements in the refrigerant circuit indicate the likelihood of moisture.
- If there are doubts about the amount of refrigerant oil in the refrigerant circuit.
- If the air conditioner compressor has to be renewed on account of internal damage (e.g. noise or no output).
- If stipulated by the vehicle-specific Workshop Manual after renewing certain components

Note

Certain impurities and old refrigerant oil are impossible or difficult to remove properly from the refrigerant circuit using compressed air. Such impurities can be removed for example by flushing with refrigerant R134a *⇒ page 115* *.*

- Blowing out refrigerant circuit ⇒ page 114

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5.4.1 Blowing out refrigerant circuit

Note

- *In the case of vehicles on which the refrigerant lines have no threads for connection of adapters V.A.G -1785- , use is to be made, for example, for blowing out the individual components of a blow-out gun with rubber mouthpiece or an adapter from the VW/Audi passenger vehicle adapter set -VAS 6338/1- . Special care must be taken not to damage the connections (crushing or scratching) when using a blow-out gun with rubber mouthpiece.*
- *The evaporator is to be blown out by way of the connection for the low-pressure line (large diameter) after detaching the expansion valve or removing the restrictor.*
- *Always flush or blow out components in the direction opposite to refrigerant flow.*
- *Check expansion valve and renew if dirty or corroded.*
- *If dark, sticky deposits cannot be removed with compressed air, flush the components concerned with refrigerant R134a or renew.*
- *Thin, light grey deposits on the insides of pipes do not impair the function of the components.*
- *After flushing, always renew receiver or reservoir and restrictor. In the case of condensers fitted with a dryer cartridge in the integrated receiver, this cartridge is to be renewed.*
- *In the case of condensers with an integrated receiver / dryer cartridge which cannot be renewed separately or which is not available as a replacement part, the condenser must be renewed after flushing ⇒ Electronic parts catalogue and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 .*
- *Depending on the version, receivers on which the dryer cartridge can be renewed separately may be provided with an additional filter element which may have to be renewed together with the dryer cartridge.*

After blowing out the refrigerant circuit:

– Renew the vehicle-specific components (restrictor and reservoir, expansion valve and receiver or dryer cartridge) ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .

– Depending on the problem, renew the air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue or drain off the remaining refrigerant oil from the air conditioner compressor removed ⇒ page 246 (renew refrigerant circuit components) and add the specified quantity of fresh refrigerant oil again ⇒ page 288 (approved refrigerant oils and refrigerant oil capacities).

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Note

- *Replacement compressors contain a certain specified quantity of refrigerant oil. For vehicles with two evaporators, it may be necessary to additionally add a certain quantity of refrigerant oil to the circuit ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ page 288 (approved refrigerant oils and refrigerant oil capacities).*
- *If the air conditioner compressor is not to be renewed, the refrigerant oil quantity in the air conditioner compressor must be topped up in line with the specified capacity (pour out refrigerant oil and add the specified quantity to the air conditioner compressor or the refrigerant circuit again) ⇒ page 246 (renewing refrigerant circuit components) and ⇒ page 288 (approved refrigerant oils and refrigerant oil capacities).*

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– Completely re-assemble the refrigerant circuit ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).
– Evacuate and charge the refrigerant circuit as specified ⇒ page 99 and ⇒ page 103 .
– Start up the air conditioner as specified ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ page 104 .

5.5 Flushing (cleaning) refrigerant circuit with refrigerant R134a

Vehicles with high-voltage system (hybrid vehicles)

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

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WARNING

Working on vehicles with high-voltage wiring:

- *Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.*
- *High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.*
- *The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.*

DANGER!

Risk of fatal injury if high-voltage components are damaged.

Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

If work is necessary in the vicinity of high-voltage system components, perform a visual inspection of the high-voltage components and wiring to check for damage ⇒ page 6 and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

If work is necessary on high-voltage system components, de-energise the high-voltage system ⇒ Electrical system; Rep. gr. 93 ; De-energising high-voltage system and note ⇒ Electrical system;

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Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

De-energising high-voltage system

DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be de-energised by a suitably qualified person (Audi high-voltage technician).*
- *It must be definitely confirmed that the high-voltage system is de-energised. The system may only be de-energised using the vehicle diagnostic tester via „Guided Fault Finding“.*
- *The qualified person (Audi high-voltage technician) confirms that the system is de-energised and uses the locking cap -T40262- to ensure that the system cannot be re-energised. The ignition key and the maintenance connector for high-voltage system - TW - should then be stored in a safe place by the qualified person.*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

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Note

- *De-energising high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - De-energise high-voltage system (Rep. gr. 93)`

Re-energising high-voltage system

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DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be re-energised by a suitably qualified person (Audi high-voltage technician).*
- *The system may only be re-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The vehicle is then made ready for operation again by the qualified person (Audi high-voltage technician).*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

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Note

- *Re-energise high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - Re-energise high-voltage system (Rep. gr. 93)`

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DANGER!

When working on a vehicle with the ignition switched on or while the drive system is active, the engine can start unexpectedly and exhaust fumes can cause a health hazard in closed rooms. Moving parts can trap or draw in parts of the body and/or clothing (safety hazard).

Before switching on the ignition, perform the following steps:

- *Move selector lever to position P*
- *Activate parking brake*
- *Switch off ignition*
- *Open bonnet*
- *Connect battery charger (e.g. -VAS 5095A-) to jump-start connections of 12 V electrical system*
- *Switch on ignition*

– To minimise the number of automatic engine starts when the vehicle's drive system is active during test and measurement work, charge the vehicle batteries e.g. with the battery charger 60A -VAS 5904- in battery standby mode ⇒ Electrical system; Rep. gr. 27 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

– For test and measurement work that requires the vehicle's drive system to be active or the ignition to be switched on, move the selector lever to position „P“, activate the parking brake and arrange the tools needed so that they cannot come into contact with moving components of the engine and so that they cannot even come near to components that turn when the engine is running.

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Note

- *Move the selector lever to position „P“ and activate the parking brake before performing test and measurement work for which the ignition must be switched on but where the vehicle's drive system does not need to be active.*
- *The status of the drive system is shown by the control unit in dash panel insert -J285- via the „power meter“ ⇒ Owner's Manual .*
- *Activating and deactivating drive system ⇒ Owner's Manual (note display of control unit in dash panel insert -J285-).*

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All vehicles

Caution

- *If there is a possibility that chemical substances (sealing additives) for sealing leaks have been added to the refrigerant circuit to be flushed, do not connect the air conditioner service station to this refrigerant circuit and do not flush this refrigerant circuit.*
- *Chemical substances (sealing additives) for sealing leaks form deposits in the refrigerant circuit which will impair operation of the air conditioning system and lead to failure of the system (and of the air conditioner service station).*
- *Customers should be informed that the air conditioner in their vehicle contains substances not approved by Audi and that the system can therefore not be flushed and serviced by your workshop.*

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Note

- *Audi does not permit the use of chemical substances (sealing additives) to seal leaks in the refrigerant circuit.*
- *Chemical substances (sealing additives) for sealing leaks in the refrigerant circuit generally react with the ambient air or the humidity contained in it. They cause malfunctioning of valves and other components with which they come into contact on account of deposits in the refrigerant circuit (and in the air conditioner service station being used). These deposits cannot be completely removed from the components affected (even by flushing). The refrigerant circuit can therefore only be repaired by renewing all the components which have come into contact with this substance.*
- *Chemical substances (sealing additives) for sealing leaks in the refrigerant circuit are normally not outwardly apparent and the identification stickers which should be affixed for this purpose are usually non-existent. Vehicles with an unknown history should therefore be treated with due caution.*

- The best way of removing moisture, impurities (e.g. abrasion from a defective air conditioner compressor) and old refrigerant oil without any unnecessary loss of refrigerant and without extensive assembly work, whilst at the same time ensuring environmental compatibility, is to flush the refrigerant circuit with refrigerant R134a.

The refrigerant circuit is to be flushed:

– In there is any dirt or similar in the circuit.

– If vacuum reading is not maintained on evacuating a leak-free refrigerant circuit (pressure build-up due to moisture in refrigerant circuit)

– If the refrigerant circuit has been left open for longer than the normal assembly time (e.g. following an accident).

– If pressure and temperature measurements in the refrigerant circuit indicate the likelihood of moisture.

– If there are doubts about the amount of refrigerant oil in the refrigerant circuit.

– If the air conditioner compressor has to be renewed on account of internal damage (e.g. noise or no output).

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– If stipulated by the vehicle-specific workshop manual following replacement of certain components.

Tools required

- Air conditioner service station with flushing attachment (these air conditioner service stations feature the additional function „Flushing refrigerant circuit“ and the necessary flushing attachment for refrigerant circuits) ⇒ Workshop equipment and special tools catalogue
- Adapter set for refrigerant circuits -VAS 6338/1- ⇒ page 138 and ⇒ Workshop equipment and special tools catalogue
-

Note

- *If no air conditioner service station with flushing attachment is available ⇒ Workshop equipment and special tools catalogue and depending on the version of the air conditioner service station being used, the refrigerant circuit can also be flushed with this employing the refrigerant circuit flushing attachment ⇒ Workshop equipment and special tools catalogue , however flushing must then be performed manually.* *⇒ page 125*
- *Use can be made for vehicles with screw connections at the refrigerant circuit of the adapter -V.A.G 1785/7- and adapter -V.A.G 1785/8- from the VW/Audi passenger vehicle adapter set -VAS 6338/1- . Two adapters -V.A.G 1785/8- are required for a vehicle with screw connections at the air conditioner compressor and reservoir.*
- *The adapter set for refrigerant circuits -VAS 6338/1- also contains a short filler hose -VAS 6338/31- with 5/8 -18 UNF connections and a large inside diameter (commercially available).*

Preparation

– Discharge the refrigerant circuit ⇒ page 98 .

– Remove the air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

Vehicle with restrictor and reservoir

– Remove restrictor (vehicle-specific) and re-connect pipes ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific Workshop Manual).

– Remove the reservoir (vehicle-specific) and re-connect the lines (for this purpose, make use of an adapter and the charging hose -VAS 6338/31- from the VW/Audi passenger vehicle adapter set -VAS 6338/1-) ⇒ page 138 , ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

Note

It would be possible to flush the reservoir, however on account of its large internal volume it holds too much liquid refrigerant. On extracting this refrigerant, the reservoir would ice up severely, the refrigerant would only evaporate very slowly and the extraction process would be excessively long.

Vehicle with expansion valve and receiver

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– Remove the receiver (vehicle-specific, not necessary with all vehicles) and re-connect the lines (for this purpose, make use of an adapter and the charging hose -VAS 6338/31- from the VW/Audi passenger vehicle adapter set -VAS 6338/1-) ⇒ page 138 , ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

Note

- *Depending on design, the receiver can be flushed (remove the fitted dryer cartridge if applicable) ⇒ page 138 , ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *If the receiver is attached to the condenser (e.g. on Audi A3 as of Model Year 2004), it is not removed for flushing (its design makes it suitable for flushing and it is only renewed after flushing) ⇒ page 138 and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *In the case of condensers with an integrated receiver / dryer cartridge which cannot be renewed separately or which are not available separately, the condenser is to be renewed after flushing. On these vehicles, the condenser is then to be renewed together with the receiver ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .*
- *Depending on the version, receivers on which the dryer cartridge can be renewed separately may be provided with an additional filter element which may have to be renewed together with the dryer cartridge.*

– On vehicles with a dryer cartridge in the receiver at the condenser (vehicle-specific), remove the dryer cartridge and reseal the opening at the receiver ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

– Remove the expansion valve (vehicle-specific) and replace it with an adapter from the VW/Audi passenger vehicle adapter set -VAS 6338/1- ⇒ page 138 , ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

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Note

If there is no suitable adapter for the expansion valve in the VW/Audi passenger vehicle adapter set -VAS 6338/1- , the expansion valve removed can also be drilled open (the old expansion valve generally has to be renewed and is therefore no longer needed).

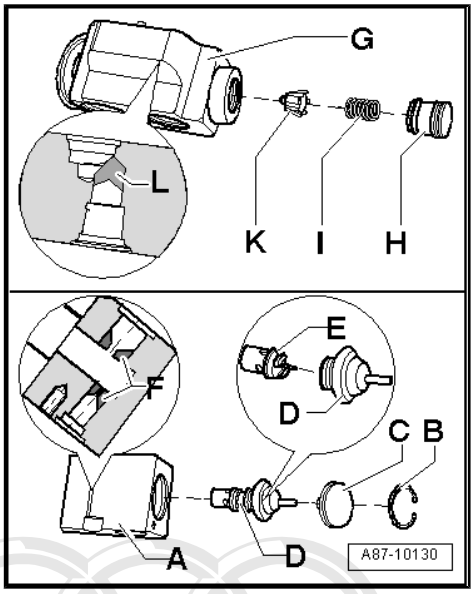
Caution

- ***Take care not to damage the sealing surfaces at the expansion valve when drilling it open.***
- ***Otherwise, refrigerant will escape at damaged sealing surfaces.***

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Note

- *Before drilling open, remove the control element and then drill open the expansion valve using a suitable drill bit for example (bit diameter e.g. 6.0 mm).*
- *Certain components have to be removed from the expansion valve before drilling it open.*
- *There are different expansion valve versions with differing design. With version -A-, the parts -B-, -C- and -D- have to be removed for example. Then separate part -E- (control element) from part -D-. After doing so, use a suitable bit to drill open the expansion valve in area -F-.*
- *With version -G-, the parts -H-, -I- and -K- must be removed for example and the area -L- then drilled open using a suitable bit.*



– Remove swarf remnants from the expansion valve after drilling open.

– Re-install the parts -B-, -C- and -D- with version -A- or part -H- with version -G-.

Note

On vehicles with two evaporators, the circuit to the second evaporator is to be separated from the circuit of the first evaporator and flushed in a separate operation ⇒ page 138 , ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

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Flushing

– Check the amount of refrigerant in the air conditioner service station, it must contain at least 7 kg of refrigerant R134a.

Note

If applicable, switch on the heater attached to the air conditioner service station for the refrigerant cylinder installed in the air conditioner service station prior to the first flushing operation (to increase the pressure in the refrigerant cylinder) and switch it off again before the first extraction operation during the flushing cycle.

– Discharge the used oil container of the air conditioner service station.

– Connect the supply hose (high-pressure end) of the air conditioner service station with an adapter to the low-pressure pipe to the air conditioner compressor (pipe with larger diameter) ⇒ page 138 .

– Connect the return hose (low-pressure or suction end) of the air conditioner service station to the outlet of the refrigerant circuit flushing attachment.

– Connect the inlet of the refrigerant circuit flushing attachment with an adapter to the high-pressure line to the air conditioner compressor (line with smaller diameter) ⇒ page 138 .

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Note

- *The components are always flushed in the direction opposite to that of refrigerant flow during air conditioner operation ⇒ page 127 .*
- *When flushing, impurities from the refrigerant circuit ingress into the refrigerant circuit flushing attachment and the air conditioner service station, where they are retained in the built-in filters and dryer. Depending on the nature of the impurities, these components are to be renewed more frequently in line with the operating instructions for the air conditioner service station or the refrigerant circuit flushing attachment.*
- *Depending on the nature and severity of the contamination of the flushed refrigerant circuits, the filter in the refrigerant circuit flushing kit should be renewed at the latest after 5 to 10 flushing cycles (flushed vehicles). After flushing a severely contaminated refrigerant circuit (the refrigerant oil from the refrigerant circuit is black and viscous or there is a lot of swarf in the refrigerant circuit), the filter is to be renewed. In the case of such severely contaminated refrigerant circuits it is also appropriate to flush the circuit again after renewing the filter.*
- *Depending on the nature of the impurities, dirt (used refrigerant oil and abrasion from the air conditioner compressor) accumulates at the inspection port of the refrigerant circuit flushing attachment. If applicable, clean this sight glass after flushing and flush the refrigerant circuit again in one operation as a check (one operation is then sufficient).*
- *Liquid refrigerant cannot be routed at the necessary rate through the expansion valve, restrictor and desiccant bag of certain receivers. These components are therefore to be removed and replaced with adapters if applicable ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *Adapters for connection of air conditioner service station and for bridging certain refrigerant circuit components ⇒ page 138 .*

– Switch on the air conditioner service station and flush the refrigerant circuit (duration approx. 1 to 1.5 hours for one flushing cycle with three flushing operations).

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Note

- *The flushing operation is to be performed in line with the operating instructions for the air conditioner service station.*
- *Depending on the version of the air conditioner service station, the used oil container may only hold approx. 125 cm ^{3} of refrigerant oil. If a system with a larger refrigerant oil quantity is to be flushed, it may be necessary to empty the used oil container after the first flushing operation in a flushing cycle.*
- *Observe the refrigerant flowing back out of the refrigerant circuit into the air conditioner service station. Refrigerant circuit cleaning has not been completed until the refrigerant flowing through the inspection port of the refrigerant circuit flushing attachment into the air conditioner service station is clear and completely colourless.*
- *During flushing, the entire refrigerant oil is rinsed out of the refrigerant circuit (with the exception of slight residue in the evaporator, for example; this can however be ignored).*
- *In the case of extremely severe contamination, it may be necessary to perform flushing twice (two flushing cycles with three flushing operations each).*

Sequence of flushing operation (sequence takes place automatically in line with air conditioner service station program)

- After switch-on, the flushing circuit (refrigerant circuit with connecting hoses and refrigerant circuit flushing attachment) is initially evacuated and the refrigerant circuit checked for leaks (depending on the version of the air conditioner service station, manual switching to next step may be necessary).
- A specified quantity of refrigerant (e.g. 5 kg) is added to the evacuated refrigerant circuit via the high-pressure end of the air conditioner service station (in the direction opposite to the normal flow direction during air conditioner operation and thus on the low-pressure end of the vehicle refrigerant circuit) or refrigerant is added until the refrigerant circuit and the inspection ports of the refrigerant circuit flushing attachment have been completely filled with liquid refrigerant (depending on the version of the air conditioner service station, the system detects that there has been no further inflow of refrigerant over a certain period for example).
- Once the specified quantity of refrigerant has been added, the heater of the refrigerant circuit flushing attachment may be switched on for example depending on the version of the air conditioner service station and the refrigerant circuit flushing attachment (only if the refrigerant is extracted in gaseous form from the refrigerant circuit flushing attachment).
- After the refrigerant has been extracted, the heater of the refrigerant circuit flushing attachment is switched off (if fitted). Depending on the version, the refrigerant circuit may be briefly evacuated again and, following evacuation, the refrigerant oil extracted from the refrigerant circuit is separated by the air conditioner service station.
- The refrigerant charging, extraction (and evacuation) process is repeated twice (in other words it is implemented a total of three times).
- Following extraction for the third time, the flushing circuit is evacuated depending on the version of the air conditioner service station.

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– On completion of flushing, check the inspection port(s) of the refrigerant circuit flushing attachment. If these are contaminated, they are to be cleaned if necessary in line with the operating instructions for the refrigerant circuit flushing attachment or air conditioner service station. Flushing is then to be performed again as a check (one operation with a duration of approx. 30 min. is sufficient).
– Check the pressure in the refrigerant circuit. There must not be any positive pressure in the refrigerant circuit (evacuate briefly again if necessary).
– Detach the connections to the air conditioner service station from the vehicle refrigerant circuit (there must not be any positive pressure in the refrigerant circuit).
– Renew the vehicle-specific components (restrictor and reservoir, expansion valve and receiver or dryer cartridge in the receiver) ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .
– Depending on the problem, renew the air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue or drain off the remaining refrigerant oil from the air conditioner compressor removed ⇒ page 246 (renew refrigerant circuit components) and add the specified quantity of fresh refrigerant oil again ⇒ page 288 (approved refrigerant oils and refrigerant oil capacities).

Note

♦ *Replacement compressors contain a certain specified quantity of refrigerant oil. For vehicles with two evaporators, it may be necessary to additionally add a certain quantity of refrigerant oil to the circuit ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ page 288 (approved refrigerant oils and refrigerant oil capacities).*

♦ *If the air conditioner compressor is not to be renewed, the refrigerant oil quantity in the air conditioner compressor must be topped up in line with the specified capacity (pour out refrigerant oil and add the specified quantity to the air conditioner compressor or the refrigerant circuit again) ⇒ page 246 (renewing refrigerant circuit components) and ⇒ page 288 (approved refrigerant oils and refrigerant oil capacities).*

– Completely re-assemble the refrigerant circuit ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).
– Evacuate and charge the refrigerant circuit as specified ⇒ page 99 and ⇒ page 103 .
– Start up the air conditioner as specified ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ page 104 .

♦ Block diagrams for various flushing circuits ⇒ page 127
♦ Adapters for connecting flushing circuits ⇒ page 138
♦ Flushing electrically driven air conditioner compressor (removing refrigeration oil) ⇒ page 132

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5.5.1 Block diagrams for various flushing circuits

Note

- *The arrows in the following illustrations indicate the direction of refrigerant flow on flushing (during flushing, the refrigerant flows in the direction opposite to that in air conditioner operation; the high-pressure end of the air conditioner service station is thus connected to the low-pressure connection of the refrigerant circuit to the air conditioner compressor).*
- *The block diagrams illustrate a refrigerant circuit with restrictor and reservoir and a refrigerant circuit with expansion valve, receiver and a second evaporator (optional extra for certain vehicles).*
- *Depending on the design of the air conditioner service station, non-return valves may be fitted between the refrigerant circuit and the air conditioner service station (to guarantee the correct direction of refrigerant flow on flushing).*

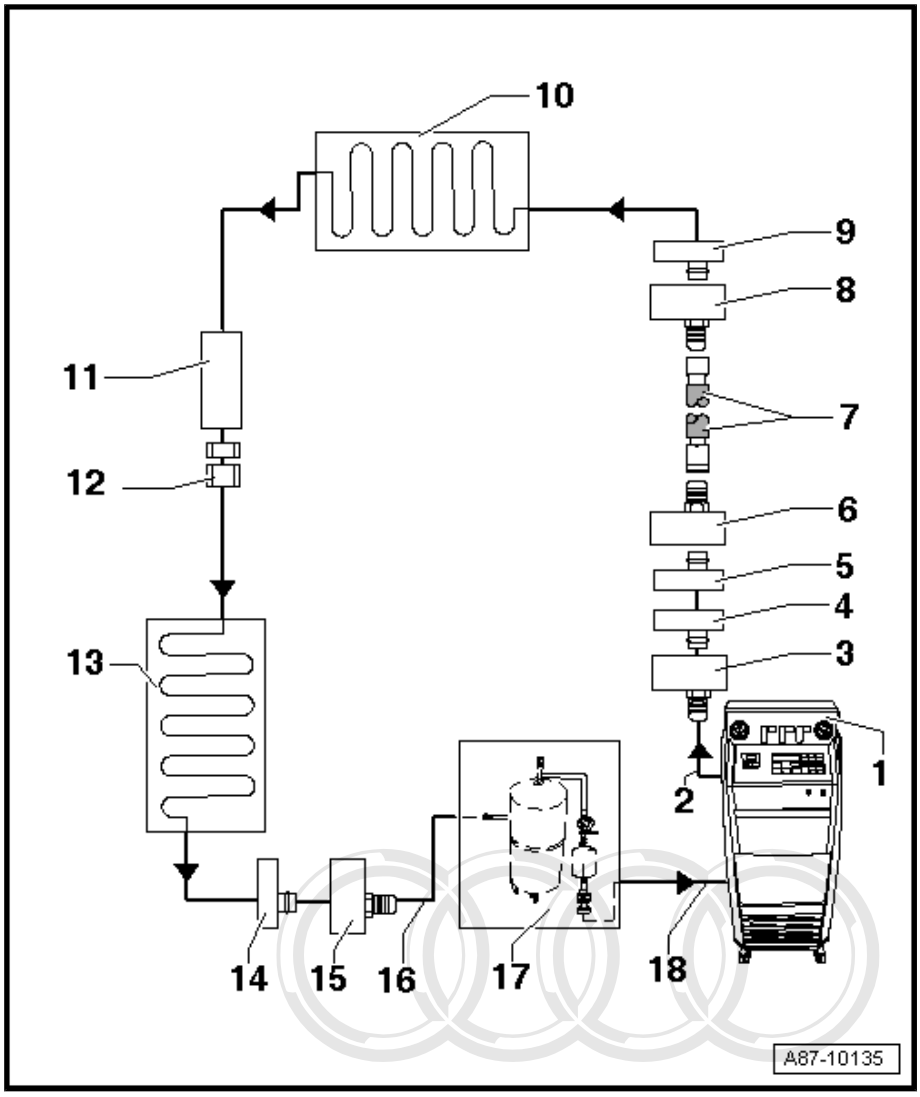
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Refrigerant circuit with restrictor and reservoir

Note

On vehicles with a restrictor and reservoir, the restrictor and reservoir are removed and the lines unfastened to remove the restrictor are connected back together. The line connections to the reservoir removed are connected together with two adapters and the charging hose -VAS 6338/31- (from the VW/Audi passenger vehicle adapter set -VAS 6338/1-).

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1 - Air conditioner service station

- With electronics and a flushing program, e.g. Air conditioner service station with flushing attachment ⇒ Workshop equipment and special tools catalogue
- If use is made of an air conditioner service station with no flushing program, the process is to be implemented manually (evacuation, 3x flushing with at least 4 kg of refrigerant each time, extraction of refrigerant again, evacuation).

2 - Refrigerant hose of air conditioner service station

- From the high-pressure end of the air conditioner service station (generally red coloured) to the connection for the low-pressure end of the air conditioner compressor at the refrigerant circuit (larger diameter)

3 - Adapter for connection (low-pressure side) at refrigerant circuit

- Different versions depending on vehicle ⇒ page 138
- From adapter set for refrigerant circuits -VAS 6338/1-

4 - Connection (low-pressure side) at refrigerant circuit

- Different versions depending on vehicle ⇒ page 138
- At the refrigerant pipe from the air conditioner compressor to the reservoir

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5 - Connection to reservoir

- Different versions depending on vehicle ⇒ page 138
- At the refrigerant pipe from the air conditioner compressor to the reservoir

6 - Adapter for bridging reservoir after removal

- Different versions depending on vehicle ⇒ page 138
- From adapter set for refrigerant circuits -VAS 6338/1-

7 - Filler hose for refrigerant ⇒ page 138

- For example filler hose -VAS 6338/31- (from adapter set for refrigerant circuits -VAS 6338/1-)

8 - Adapter for bridging reservoir after removal

- Different versions depending on vehicle ⇒ page 138
- From adapter set for refrigerant circuits -VAS 6338/1-

9 - Connection to reservoir

- Different versions depending on vehicle ⇒ page 138

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10 - Evaporator

11 - Fitting location for restrictor

- ❑ Restrictor removed.
- ❑ Remove the restrictor ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

12 - Bolt connection in refrigerant line

- ❑ Screw back together following restrictor removal ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

13 - Condenser

14 - Connection (high-pressure side) at refrigerant circuit

- ❑ Different versions depending on vehicle ⇒ page 138

15 - Adapter for connection (high-pressure side) at refrigerant circuit

- ❑ Different versions depending on vehicle ⇒ page 138
- ❑ From adapter set for refrigerant circuits -VAS 6338/1-

16 - Filler hose to flushing kit for refrigerant circuits

- ❑ From the high-pressure end connection of the air conditioner compressor at the refrigerant circuit (smaller diameter) to the inlet of the refrigerant circuit flushing attachment.

17 - Flushing kit for refrigerant circuits

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- ❑ Different versions and different design of flushing kit for refrigerant circuits ⇒ Workshop equipment and special tools catalogue
- ❑ With filter, sight glass, safety valve, heater, refrigerant vessel etc. (depending on version)
- ❑ Depending on the design of the air conditioner service station and the refrigerant circuit flushing kit, a non-return valve may be fitted at the outlet of the refrigerant circuit flushing kit (to guarantee the correct direction of refrigerant flow when flushing).

18 - Refrigerant hose of air conditioner service station

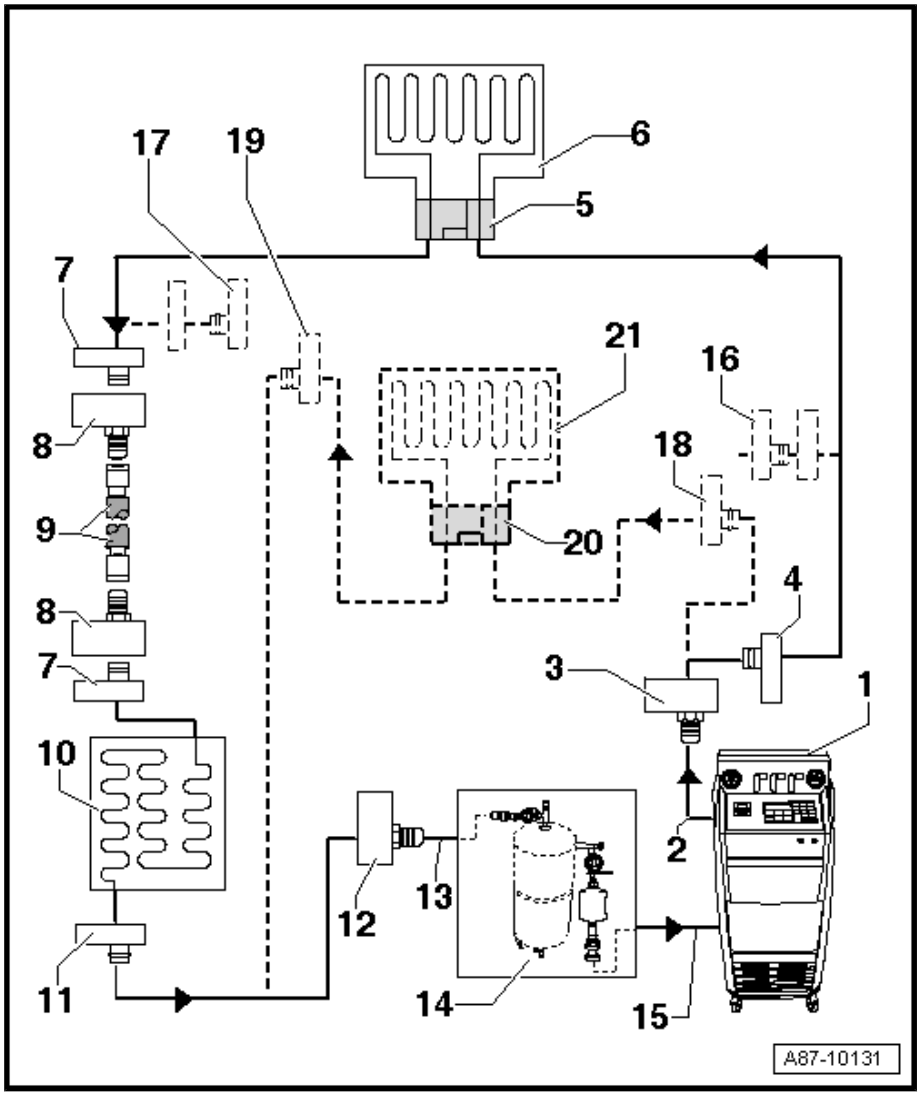
- ❑ From low-pressure side of air conditioner service station (usually blue) to outlet of flushing kit for refrigerant circuits

Refrigerant circuit with expansion valve, receiver and second evaporator

Note

- *This block diagram shows a refrigerant circuit with expansion valve, receiver and a second evaporator (optional extra for certain vehicles).*
- *On vehicles with expansion valve and receiver, the expansion valve is removed and replaced with an adapter. Depending on the vehicle, the receiver is also removed and the pipe connections to the receiver are connected using two adapters and a filler hose.*
- *On vehicles with only one evaporator, the components from item „16“ onwards are not fitted / are not required.*

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1 - Air conditioner service station

- With electronics and flushing program, Air conditioner service station with flushing kit ⇒ Workshop equipment and special tools catalogue
- If use is made of an air conditioner service station with no flushing program, the process is to be implemented manually (evacuation, 3x flushing with at least 4 kg of refrigerant each time, extraction of refrigerant again, evacuation).

2 - Refrigerant hose of air conditioner service station

- From the high-pressure end of the air conditioner service station (generally red coloured) to the connection for the low-pressure end of the air conditioner compressor at the refrigerant circuit (larger diameter)

3 - Adapter for connection (low-pressure side) at refrigerant circuit

- Different versions depending on vehicle ⇒ page 138
- From adapter set for refrigerant circuits -VAS 6338/1-

4 - Connection (low-pressure side) at refrigerant circuit

- Different versions depending on vehicle ⇒ page 138

5 - Adapter for removed expansion valve

- Different versions depending on vehicle ⇒ page 138
- From adapter set for refrigerant circuits -VAS 6338/1-

6 - Evaporator

7 - Connection to receiver

- Different versions depending on vehicle ⇒ page 138
- Not fitted on vehicles with a dryer cartridge in the receiver at the condenser or with a receiver installed in the condenser ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

8 - Adapter for bridging removed receiver

- Not necessary on all vehicles
- Different versions depending on vehicle ⇒ page 138
- From adapter set for refrigerant circuits -VAS 6338/1-

9 - Filler hose for refrigerant ⇒ page 138

- For example filler hose -VAS 6338/31- (from adapter set for refrigerant circuits -VAS 6338/1-)

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10 - Condenser

- ❑ If a receiver with dryer cartridge is fitted at the condenser, the dryer cartridge must be removed (seal receiver at or in condenser again following removal) ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 vehicle-specific workshop manual).
- ❑ If the receiver is attached directly to the condenser, the receiver is only to be removed and renewed after flushing ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

Note

11 - Connection (high-pressure side) at refrigerant circuit

- ❑ Different versions depending on vehicle ⇒ page 138

12 - Adapter for connection (high-pressure side) at refrigerant circuit

- ❑ Different versions depending on vehicle ⇒ page 138
- ❑ From adapter set for refrigerant circuits -VAS 6338/1-

13 - Filler hose to flushing kit for refrigerant circuits

- ❑ From the high-pressure end connection of the air conditioner compressor at the refrigerant circuit (smaller diameter) to the inlet of the refrigerant circuit flushing attachment.

14 - Flushing kit for refrigerant circuits

- ❑ Different versions and different design of flushing kit for refrigerant circuits ⇒ Workshop equipment and special tools catalogue
- ❑ With filter, sight glass, safety valve, heater, refrigerant vessel etc. (depending on version)
- ❑ Depending on the design of the air conditioner service station and the refrigerant circuit flushing kit, a non-return valve may be fitted at the outlet of the refrigerant circuit flushing kit (to guarantee the correct direction of refrigerant flow when flushing).

15 - Refrigerant hose of air conditioner service station

- ❑ From low-pressure side of air conditioner service station (usually blue) to outlet of flushing kit for refrigerant circuits

16 - Adapter for sealing outlet to second evaporator

- ❑ Only required for certain vehicles with „second evaporator“ as optional extra
- ❑ From adapter set for refrigerant circuits -VAS 6338/1-

17 - Adapter for sealing outlet to second evaporator

- ❑ Only required for certain vehicles with „second evaporator“ as optional extra
- ❑ From adapter set for refrigerant circuits -VAS 6338/1-

18 - Connection (low-pressure side) at refrigerant circuit to second evaporator

- ❑ Different versions depending on vehicle ⇒ page 138
- ❑ Only fitted on certain vehicles with „second evaporator“ as optional extra

19 - Connection (high-pressure side) at refrigerant circuit to second evaporator

- ❑ Different versions depending on vehicle ⇒ page 138
- ❑ Only fitted on certain vehicles with „second evaporator“ as optional extra

20 - Adapter for expansion valve (removed) at second evaporator

- ❑ Different versions depending on vehicle ⇒ page 138
- ❑ Only required for certain vehicles with „second evaporator“ as optional extra
- ❑ From adapter set for refrigerant circuits -VAS 6338/1-

21 - Second evaporator

- ❑ Only fitted on certain vehicles with „second evaporator“ as optional extra

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5.5.2 Flushing electrically driven air conditioner compressor (removing refrigerant oil)

Vehicles with high-voltage system (hybrid vehicles)

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

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WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

WARNING

Working on vehicles with high-voltage wiring:

- *Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.*
- *High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.*
- *The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.*

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DANGER!

Risk of fatal injury if high-voltage components are damaged.

Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

If work is necessary in the vicinity of high-voltage system components, perform a visual inspection of the high-voltage components and wiring to check for damage ⇒ page 6 and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

If work is necessary on high-voltage system components, de-energise the high-voltage system ⇒ Electrical system; Rep. gr. 93 ; De-energising high-voltage system and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

De-energising high-voltage system

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DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be de-energised by a suitably qualified person (Audi high-voltage technician).*
- *It must be definitely confirmed that the high-voltage system is de-energised. The system may only be de-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The qualified person (Audi high-voltage technician) confirms that the system is de-energised and uses the locking cap -T40262- to ensure that the system cannot be re-energised. The ignition key and the maintenance connector for high-voltage system - TW - should then be stored in a safe place by the qualified person.*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

Note

- *De-energising high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - De-energise high-voltage system (Rep. gr. 93)`

Re-energising high-voltage system

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DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be re-energised by a suitably qualified person (Audi high-voltage technician).*
- *The system may only be re-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The vehicle is then made ready for operation again by the qualified person (Audi high-voltage technician).*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

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Note

- *Re-energise high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - Re-energise high-voltage system (Rep. gr. 93)`

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DANGER!

When working on a vehicle with the ignition switched on or while the drive system is active, the engine can start unexpectedly and exhaust fumes can cause a health hazard in closed rooms. Moving parts can trap or draw in parts of the body and/or clothing (safety hazard).

Before switching on the ignition, perform the following steps:

- ***Move selector lever to position P***
- ***Activate parking brake***
- ***Switch off ignition***
- ***Open bonnet***
- ***Connect battery charger (e.g. -VAS 5095A-) to jump-start connections of 12 V electrical system***
- ***Switch on ignition***

– To minimise the number of automatic engine starts when the vehicle's drive system is active during test and measurement work, charge the vehicle batteries e.g. with the battery charger 60A -VAS 5904- in battery standby mode ⇒ Electrical system; Rep. gr. 27 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

– For test and measurement work that requires the vehicle's drive system to be active or the ignition to be switched on, move the selector lever to position „P“, activate the parking brake and arrange the tools needed so that they cannot come into contact with moving components of the engine and so that they cannot even come near to components that turn when the engine is running.

Note

- *Move the selector lever to position „P“ and activate the parking brake before performing test and measurement work for which the ignition must be switched on but where the vehicle's drive system does not need to be active.*
- *The status of the drive system is shown by the control unit in dash panel insert -J285- via the „power meter“ ⇒ Owner's Manual .*
- *Activating and deactivating drive system ⇒ Owner's Manual (note display of control unit in dash panel insert -J285-).*

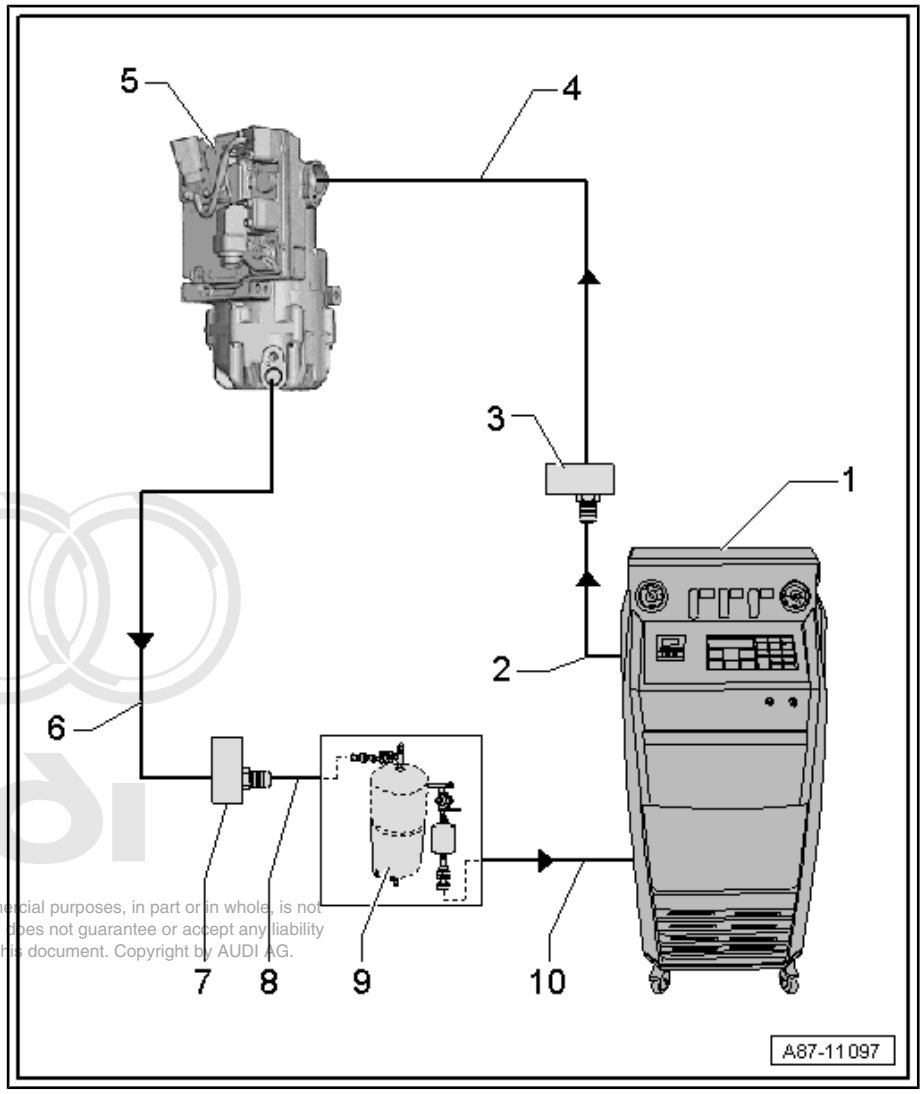
Flushing air conditioner compressor

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Note

- *The design of the electrically driven air conditioner compressor is such that the refrigeration oil cannot be poured out (there is no oil drain plug)*
- *On the electrically driven air conditioner compressor, the refrigeration oil is to be removed by flushing in flow direction (flushing in the opposite direction is not possible on account of the built-in valves).*
- *For flushing, the air conditioner compressor is to be positioned such that the connection for the refrigerant line on the high-pressure end is as low down as possible.*



1 - Air conditioner service station

- ❑ With electronics and flushing program, Air conditioner service station with flushing kit ⇒ Workshop equipment and special tools catalogue
- ❑ If use is made of an air conditioner service station with no flushing program, the process is to be implemented manually (evacuation, 3x flushing with at least 2 kg of refrigerant each time, extraction of refrigerant again, evacuation).

2 - Refrigerant hose of air conditioner service station

- ❑ From the high-pressure end of the air conditioner service station (generally red coloured) to the connection for the low-pressure end of the air conditioner compressor at the refrigerant circuit (larger diameter)

3 - Adapter for low-pressure end connection at air conditioner compressor

- ❑ Different versions depending on vehicle ⇒ page 138
- ❑ From adapter set for refrigerant circuits -VAS 6338/1-

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4 - Refrigerant line

- ❑ For connection of air conditioner compressor to adapter ⇒ Item 3 (page 137)
- ❑ To set up the flushing circuit, remove the refrigerant line to the condenser from the vehicle for example (or use a refrigerant line with part number 7L6 820 744 AD) ⇒ Electronic parts catalogue

5 - Electrically driven air conditioner compressor

- ❑ The air conditioner compressor is flushed in flow direction (from the low-pressure end inlet to the high-pressure end outlet)

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- ❑ To flush as much refrigeration oil as possible out of the air conditioner compressor, the compressor is to be positioned with the high-pressure end outlet as low down as possible when flushing

6 - Refrigerant line

- ❑ For connection of air conditioner compressor to adapter ⇒ Item 7 (page 138)
- ❑ To set up the flushing circuit make use of a refrigerant line with part number 7L6 820 721 BF for example ⇒ Electronic parts catalogue

7 - Adapter for high-pressure end connection at air conditioner compressor

- ❑ Different versions depending on vehicle ⇒ page 138
- ❑ From adapter set for refrigerant circuits -VAS 6338/1-

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8 - Filler hose to flushing kit for refrigerant circuits

- ❑ From the high-pressure end connection of the air conditioner compressor at the refrigerant circuit (smaller diameter) to the inlet of the refrigerant circuit flushing attachment.

9 - Flushing kit for refrigerant circuits

- ❑ Different versions and different design of flushing kit for refrigerant circuits ⇒ Workshop equipment and special tools catalogue
- ❑ With filter, sight glass, safety valve, heater, refrigerant vessel etc. (depending on version)
- ❑ Depending on the design of the air conditioner service station and the refrigerant circuit flushing kit, a non-return valve may be fitted at the outlet of the refrigerant circuit flushing kit (to guarantee the correct direction of refrigerant flow when flushing).

10 - Refrigerant hose of air conditioner service station

- ❑ From low-pressure side of air conditioner service station (usually blue) to outlet of flushing kit for refrigerant circuits

5.5.3 Adapters for connecting flushing circuits

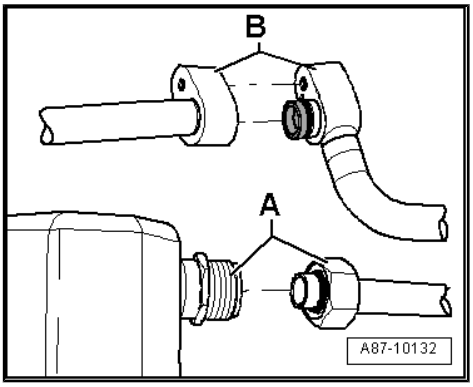
- ♦ The following table lists the various adapters required for connecting the air conditioner service station to the refrigerant circuit for flushing and for bridging the removed receiver or reservoir and expansion valve (vehicle-specific).
- ♦ Use a charging hose with 5/8 - 18 UNF connections (short version e.g. charging hose -VAS 6338/31-) to connect the two adapters fitted in place of the reservoir or receiver removed (contained in VW/Audi passenger vehicle adapter set -VAS 6338/1-).
- ♦ If a flushed refrigerant circuit is not supposed to be re-assembled immediately after flushing, leave the adapters in place at the connections and seal the connections at the adapters with the caps -VAS 6338/30- (from the adapter set for refrigerant circuits -VAS 6338/1-).
- ♦ Depending on the version of the air conditioner compressor and the production period, use may have been made of different connection and sealing methods at the refrigerant circuit ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).
- ♦ The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).

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Block or screw connections

– Screw connection -A-
– Block connection -B-

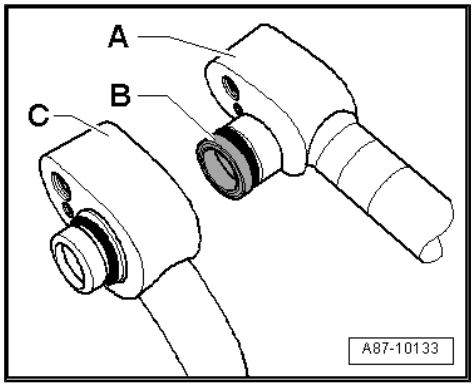
Block connections with different types of seal



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– Block connection with radial seal -A- (with plastic or metal guide -B-)
– Block connection with axial seal -C-



Audi A1 and Audi A2

Vehicle	Adapters required for the connections to the air conditioner compressor	Adapters required for reservoir/receiver connections	Other requirements
Audi A1 (8X_) 2011 ►	– Compressor manufacturer „Denso“, „Sanden“ or „Delphi“ ◆ Adapter -VAS 6338/12- (low-pressure side) ◆ High-pressure end Adapter -VAS 6338/3- or Adapter -VAS 6338/2- (depending on the design of the air conditioner compressor and the corresponding refrigerant line)	Different versions – Version 1 (receiver integrated in condenser): No adapter required; the desiccant bag is removed from the receiver at the condenser and the opening is sealed again for flushing. – Version 2 (receiver attached to condenser): No adapter required; the receiver is left installed (renewed after flushing).	Expansion valve removed and adapter -VAS 6338/34- fitted (or old expansion valve removed drilled open for flushing and re-installed) ⇒ page 122
Audi A2 (8Z_) 2001 ►	– Compressor manufacturer „Denso“ ◆ Adapter -VAS 6338/12- (low-pressure side) ◆ Adapter -VAS 6338/2- (high-pressure side)	Reservoir – Screw connection at inlet Adapter -VAS 6338/9- – Block connection with axial seal at outlet Adapter -VAS 6338/10-	- Restrictor removed, pipe connections re-assembled

Note

On the Audi A1, the receiver may be attached or integrated depending on the version of the condenser. The integrated receiver is fitted with a dryer cartridge which can be renewed separately. If the receiver is of the attached type (introduction not yet finalised), it must be renewed after flushing ⇒ Electronic parts catalogue and ⇒ Heating, air conditioning; Rep. gr. 87 .

Audi
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Audi A3, Audi Q3 and Audi TT

Vehicle	Adapters required for the connections to the air conditioner compressor	Adapters required for reservoir/receiver connections	Other requirements
Audi A3 (8L_) 1997 ➤ Audi TT (8N_) 1999 ➤	– Compressor manufacturer „Sanden“ or „Zexel / Valeo“ ♦ Adapter -VAS 6338/7- (low-pressure side) ♦ Adapter -VAS 6338/2- (high-pressure side)	Receiver – Block connections with axial seal at inlet and outlet Adapter -VAS 6338/2- (2x required)	Expansion valve removed and Adapter -VAS 6338/19- fitted (or drilled-open expansion valve e.g. 6N0 820 679 C fitted ⇒ page 122)
Audi A3 (8P_) 2004 ➤ Audi TT (8J_) 2007 ➤ Audi Q3 (8U_) 2012 ➤	– Compressor manufacturer for Audi A3 / Audi Q3 „Sanden“, „Denso“, „Delphi“ or „Zexel / Valeo“ – Compressor manufacturer for Audi TT „Denso“ ♦ Adapter -VAS 6338/12- (low-pressure side) ♦ Adapter -VAS 6338/3- (high-pressure side)	Receiver (different versions) – Adapter not required, receiver remains in position – Depending on the version of the condenser, it may be necessary to remove the dryer cartridge from the receiver at the condenser before flushing and to seal the opening again (refer to note).	Expansion valve removed and Adapter -VAS 6338/18- (or drilled-open expansion valve e.g. 1K0 820 679) fitted ⇒ page 122

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Note

- *The design of the receiver on the Audi A3, Audi Q3 and Audi TT differs depending on the condenser manufacturer. The Audi TT with 5-cyl. engine is fitted for example with a different type of condenser to vehicles with a 4 or 6-cyl. engine. This condenser features an integrated receiver for example. The integrated receiver contains a dryer cartridge which is currently not always available as a replacement part. On vehicles fitted with this condenser, it may therefore be necessary to renew the entire condenser after rectifying any problems ⇒ Electronic parts catalogue and ⇒ Heating, air conditioning; Rep. gr. 87 .*
- *In the case of condensers with an integrated receiver / dryer cartridge which cannot be renewed separately or which are not available separately, the condenser is to be renewed after flushing (together with the built-in dryer cartridge) ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .*

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Audi 80 ,Audi 90, Audi Coupé, Audi Cabriolet and Audi A4

Vehicle	Adapters required for the connections to the air conditioner compressor	Adapters required for reservoir connections	Other requirements
Audi 80 (8A_/ 8C_), Audi Coupé (8B_), Audi Cabriolet (8G_) ► 2002 Audi A4 (8D_) 1995►	– Compressor manufacturer „Zexel / Valeo“ (screw connections) ♦ Adapter - VAG 1785/8- (low-pressure side) ♦ Adapter - VAG 1785/7- (high-pressure side)	Reservoir with different connection versions ♦ Version „1“ – Screw connection at inlet Adapter - VAS 6338/9- – Screw connection at outlet Adapter - VAG 1785/8-	- Restrictor removed, pipe connections re-assembled
	– Compressor manufacturer „Denso“ (block connections with radial and axial seal) ♦ Adapter -VAS 6338/12- (low-pressure side) ♦ Adapter -VAS 6338/2- (high-pressure side)	♦ Version „2“ – Screw connection at inlet Adapter - VAS 6338/9- – Block connection with axial seal at outlet Adapter - VAS 6338/10-	
Audi A4 (8E_) 2001 ► Audi A4 Cabriolet (8H_) 2003 ►	– Compressor manufacturer „Denso“ (block connections with radial and axial seal) ♦ Adapter -VAS 6338/12- (low-pressure side) ♦ Adapter -VAS 6338/2- (high-pressure side)	Reservoir with different connection versions ♦ Version „1“ – Block connections with axial seal at inlet and outlet ♦ Adapter -VAS 6338/10- (2x required)	- Restrictor removed, pipe connections re-assembled

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Vehicle	Adapters required for the connections to the air conditioner compressor	Adapters required for reservoir connections	Other requirements
	– Compressor manufacturer „Denso“ (block connections with radial seal) ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) ♦ Adapter -VAS 6338/12- (low-pressure side) ♦ Adapter -VAS 6338/3- (high-pressure side)	♦ Version „2“ – Block connections with radial seal at inlet and outlet ♦ Adapter -VAS 6338/8- (2x required)	
Audi A4 (8K_) 2008 ►	– Compressor manufacturer „Denso“ ♦ Adapter -VAS 6338/12- (low-pressure side) ♦ Adapter -VAS 6338/3- (high-pressure side)	Receiver (different versions) – Adapter not required, receiver remains in position – Depending on the version of the condenser, it may be necessary to remove the dryer cartridge from the receiver at the condenser before flushing and to seal the opening again (refer to note).	Expansion valve removed and Adapter -VAS 6338/36- (or drilled-open expansion valve e.g. 8K0 820 679 A) fitted ⇒ page 122 – The refrigerant line with internal heat exchanger remains in position or is installed again after fitting the adapter.

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Note

- *The design of the receiver on the Audi A4 (8K_) 2008 > differs depending on the condenser manufacturer ⇒ Air conditioning; Rep. gr. 87 . The receiver may be attached or integrated depending on the version of the condenser. The integrated receiver contains a dryer cartridge which is currently not always available as a replacement part. On vehicles fitted with this condenser, it may therefore be necessary to renew the entire condenser after rectifying any problems ⇒ Electronic parts catalogue .*
- *In the case of condensers with an integrated receiver / dryer cartridge which cannot be renewed separately or which are not available separately, the condenser is to be renewed after flushing (together with the built-in dryer cartridge) ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .*

Audi A5 Coupé and Sportback, Audi Q5, Audi A5 Cabriolet

Vehicle	Adapters required for the connections to the air conditioner compressor	Adapters required for receiver connections	Other requirements
Audi A5 Coupé and Sportback (8T_) 2008 ► Audi Q5 (8R_) 2008 ► Audi A5 Cabriolet (8F_) 2009 ►	– Compressor manufacturer „Denso“ ♦ Adapter -VAS 6338/12- (low-pressure side) ♦ Adapter -VAS 6338/3- (high-pressure side)	Receiver (different versions) – Adapter not required, receiver remains in position – Depending on the version of the condenser, it may be necessary to remove the dryer cartridge from the receiver at the condenser before flushing and to seal the opening again (refer to note).	Expansion valve removed and Adapter -VAS 6338/36- (or drilled-open expansion valve e.g. 8K0 820 679 A) fitted ⇒ page 122 – The refrigerant pipe with internal heat exchanger remains in position or is installed again after fitting the adapter.

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Note

- *The design of the receiver differs on these vehicles depending on the condenser manufacturer ⇒ Air conditioning; Rep. gr. 87 . The receiver may be attached or integrated depending on the version of the condenser. The integrated receiver contains a dryer cartridge which is currently not always available as a replacement part. On vehicles fitted with this condenser, it may therefore be necessary to renew the entire condenser after rectifying any problems ⇒ Electronic parts catalogue .*
- *In the case of condensers with an integrated receiver / dryer cartridge which cannot be renewed separately or which are not available separately, the condenser is to be renewed after flushing (together with the built-in dryer cartridge) ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .*

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Audi Q5 hybrid

Vehicle	Adapters required for connections to/at air conditioner compressor	Adapters required for receiver connections	Other requirements
Audi Q5 (8R_) 2011 ►	Adapters required for the connections to the air conditioner compressor – Compressor manufacturer „Denso“ ♦ Adapter -VAS 6338/12- (low-pressure side) ♦ Adapter -VAS 6338/3- (high-pressure side)	Receiver (different versions) – Adapter not required, receiver remains in position – Depending on the version of the condenser, it may be necessary to remove the dryer cartridge from the receiver at the condenser before flushing and to seal the opening again (refer to note).	Expansion valve removed and Adapter - VAS 6338/36- (or drilled-open expansion valve e.g. 8K0 820 679 A) fitted ⇒ page 122 – The refrigerant line with internal heat exchanger remains in position or is installed again after fitting the adapter.

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Vehicle	Adapters required for connections to/at air conditioner compressor	Adapters required for receiver connections	Other requirements
♦ Additionally for vehicles with battery cooling module		For flushing the circuit with the evaporator in the air conditioning unit and the condenser ♦ Adapter -VAS 6338/5- for sealing the „low-pressure end“ connection (to the second evaporator in the battery cooling module) ♦ Adapter -VAS 6338/11- for sealing the „high-pressure end“ connection (to the second evaporator in the battery cooling module) ♦ Adapter -VAG 1785/5- (refer to notes)	There are various ways of flushing the circuit ♦ Refrigerant shut-off valve 1 for hybrid battery -N516- removed, drilled open, cleaned and re-installed (similar to expansion valve ⇒ page 122) ♦ Flushing of circuit in one or two operations (refer to notes)
		For flushing the evaporator in the battery cooling module and the corresponding lines ♦ Adapter -VAS 6338/3- for connecting the air conditioner service station to the „low-pressure end“ connection (to the second evaporator). ♦ Adapter -VAS 6338/4- for connecting the air conditioner service station to the „high-pressure end“ connection (to the second evaporator).	Expansion valve in refrigerant lines to second evaporator removed and adapter -VAS 6338/36- fitted (or old expansion valve removed drilled open for flushing and re-installed ⇒ page 122).

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Vehicle	Adapters required for connections to/at air conditioner compressor	Adapters required for receiver connections	Other requirements
	Adapters / lines required for connections at electrically driven air conditioner compressor (for flushing air conditioner compressor) ♦ Low-pressure end adapter -VAS 6338/12- and refrigerant line from vehicle or e.g. 7L6 820 744 AD ⇒ Electronic parts catalogue ♦ High-pressure end adapter -VAS 6338/3- and refrigerant line e.g. 7L6 820 721 BF ⇒ Electronic parts catalogue		♦ On the electrically driven air conditioner compressor, the refrigeration oil is to be removed by flushing in flow direction (flushing in the opposite direction is not possible on account of the built-in valves) ♦ For flushing, the air conditioner compressor is to be positioned such that the connection for the refrigerant line on the high-pressure end is as low down as possible

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Note

- *On vehicles with two evaporators, the refrigerant circuit is flushed in two / three operations.*
- *Currently the connections on the expansion valves at the evaporator in the air conditioning unit and at the evaporator in the battery cooling module are identical; the only differences are the control characteristics and the refrigerant shut-off valve 2 for hybrid battery -N517- .*
- *If a refrigerant shut-off valve 1 for hybrid battery -N516- is installed in the circuit to the evaporator in the air conditioning unit, the refrigerant circuit cannot be flushed. -N516- forms a constriction and prevents the refrigerant from flowing through at an adequate rate. If there are two adapters -VAG 1785/5- and the -N516- should not be drilled open, the circuit can be flushed with the evaporator in the air conditioning unit in one work step (re-assemble circuit with one charging hose and two adapters -VAG 1785/5-). If there is only one adapter -VAG 1785/5- and -N516- should not be drilled open, the circuit must be flushed in two separate work steps: from the low-pressure connection on the air conditioner compressor via the evaporator in the air conditioning unit to the connection for -N516- (removed) and from the connection for -N516- (removed) via the condenser to the high-pressure connection on the air conditioner compressor.*
- *The design of the receiver differs on these vehicles depending on the condenser manufacturer ⇒ Air conditioning; Rep. gr. 87 . The receiver may be attached or integrated depending on the version of the condenser. The integrated receiver contains a dryer cartridge which is currently not always available as a replacement part. On vehicles fitted with this condenser, it may therefore be necessary to renew the entire condenser after rectifying any problems ⇒ Electronic parts catalogue .*
- *In the case of condensers with an integrated receiver / dryer cartridge which cannot be renewed separately or which are not available separately, the condenser is to be renewed after flushing (together with the built-in dryer cartridge) ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .*

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Audi 100, Audi A6 (4A_, 4B_ and 4F_), Audi allroad and Audi V8

Vehicle	Adapters required for the connections to the air conditioner compressor	Adapters required for reservoir connections	Other requirements
Audi 100 / Audi A6 (4A_) ➤ 1998 Audi A6 (4B_) 1998 ➤ Audi allroad (4B_) ➤ 2005 Audi V8 (4C_) ➤ 1994	– Compressor manufacturer „Zexel / Valeo“ (screw connections) ◆ Adapter - VAG 1785/8- (low-pressure side) ◆ Adapter - VAG 1785/7- (high-pressure side)	Reservoir with different connection versions ◆ Version „1“ – Screw connection at inlet Adapter - VAS 6338/9- – Screw connection at outlet Adapter - VAG 1785/8-	- Restrictor removed, pipe connections re-assembled
	– Compressor manufacturer „Denso“ (block connections with radial and axial seal) ◆ Adapter -VAS 6338/12- (low-pressure side) ◆ Adapter -VAS 6338/2- (high-pressure side)	◆ Version „2“ – Screw connection at inlet Adapter - VAS 6338/9- – Block connection with axial seal at outlet Adapter - VAS 6338/10- ◆ Version „3“ – Block connections with axial seal at inlet and outlet Adapter -VAS 6338/10- (2x required)	
Audi A6 (4F_) 2005 ➤	– Compressor manufacturer „Denso“ (block connections with radial seal) ◆ Adapter -VAS 6338/12- (low-pressure side) ◆ Adapter -VAS 6338/3- (high-pressure side)	– Reservoir with block connections with radial seal at inlet and outlet ◆ Adapter -VAS 6338/8- (2x required)	- Restrictor removed, pipe connections re-assembled

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Note

The specifications for the Audi A6 (4F_) 2005 ➤ also apply to the Audi S6 and Audi RS 6.

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Audi A6 (4G_), Audi A7

Vehicle	Adapters required for the connections to the air conditioner compressor	Adapters required for receiver connections	Other requirements
Audi A6 (4G_) 2011 ➤ Audi A7 (4G_) 2011 ➤	– Compressor manufacturer „Denso“ ♦ Adapter -VAS 6338/12- (low-pressure side) ♦ Adapter -VAS 6338/3- (high-pressure side)	Receiver (different versions) – Adapter not required, receiver remains in position – Depending on the version of the condenser, it may be necessary to remove the dryer cartridge from the receiver at the condenser before flushing and to seal the opening again (refer to note).	Expansion valve removed and adapter -VAS 6338/36- fitted (or old expansion valve removed drilled open for flushing and re-installed ⇒ page 122).

Note

- *The design of the receiver differs on these vehicles depending on the condenser manufacturer ⇒ Air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .*
- *In the case of condensers with an integrated receiver / dryer cartridge which cannot be renewed separately or which are not available separately, the condenser is to be renewed after flushing (together with the built-in dryer cartridge) ⇒ Air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .*

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Audi A8

Vehicle	Adapters required for the connections to the air conditioner compressor	Adapters required for reservoir connections	Other requirements
Audi A8 (4D_) 1994 ➤	– Compressor manufacturer „Zexel / Valeo“ (screw connections) ◆ Adapter - VAG 1785/8- (low-pressure side) ◆ Adapter - VAG 1785/7- (high-pressure side)	Reservoir with different connection versions ◆ Version „1“ – Screw connection at inlet Adapter - VAS 6338/9- – Screw connection at outlet Adapter - VAG 1785/8-	- Restrictor removed, pipe connections re-assembled
	– Compressor manufacturer „Denso“ (block connections with radial and axial seal) ◆ Adapter -VAS 6338/12- (low-pressure side) ◆ Adapter -VAS 6338/2- (high-pressure side)	◆ Version „2“ – Screw connection at inlet Adapter - VAS 6338/9- – Block connection with axial seal at outlet Adapter - VAS 6338/10- ◆ Version „3“ – Block connections with axial seal at inlet and outlet Adapter -VAS 6338/10- (2x required)	
Audi A8 (4E_) 2003 ➤	– Compressor manufacturer „Denso“ (block connections with radial seal) ◆ Adapter -VAS 6338/12- (low-pressure side) ◆ Adapter -VAS 6338/3- (high-pressure side)	Reservoir – Block connections with radial seal at inlet and outlet ◆ Adapter -VAS 6338/8- (2x required)	- Restrictor removed, pipe connections re-assembled

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Vehicle	Adapters required for the connections to the air conditioner compressor	Adapters required for reservoir connections	Other requirements
Audi A8 (4H_) 2010 ➤ ◆ Additionally for vehicles with 2 evaporators (4-zone air conditioner)	– Compressor manufacturer „Denso“ (block connections with radial seal) ◆ Adapter -VAS 6338/12- (low-pressure side) ◆ Adapter -VAS 6338/3- (high-pressure side)	– No adapter required, the desiccant bag is removed from the receiver at the condenser and the opening sealed off again for flushing.	Expansion valve removed and adapter -VAS 6338/18- fitted (or old expansion valve removed drilled open for flushing and re-installed ⇒ page 122).
		For flushing circuit with evaporator in front air conditioning unit ◆ Adapter -VAS 6338/5- for sealing connection („low-pressure side“) to second evaporator ◆ Adapter -VAS 6338/11- for sealing connection („high-pressure side“) to second evaporator) • An additional hole may have to be made in the adapters (see below) to be able to seal the refrigerant lines with the adapters -VAS 6338/5- and -VAS 6338/11-	

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Vehicle	Adapters required for the connections to the air conditioner compressor	Adapters required for reservoir connections	Other requirements
		For flushing second evaporator and corresponding pipes ♦ Adapter -VAS 6338/3- for connecting the air conditioner service station to the „low-pressure end“ connection (to the second evaporator). ♦ Adapter -VAS 6338/4- for connecting the air conditioner service station to the „high-pressure end“ connection (to the second evaporator). • The adapter may have to be reworked (see below) to be able to connect the refrigerant line to the adapter -VAS 6338/3-	Expansion valve in refrigerant lines to second evaporator removed and adapter -VAS 6338/18- fitted (or old expansion valve removed drilled open for flushing and re-installed ⇒ page 122).

Note

♦ *On vehicles with two evaporators, the refrigerant circuit is flushed in two operations.*

♦ *At present the front and rear expansion valves have identical connections (only the control characteristic differs).*

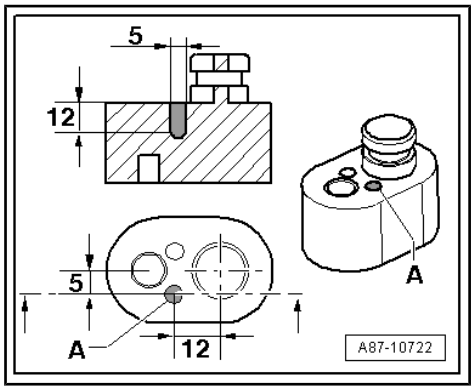
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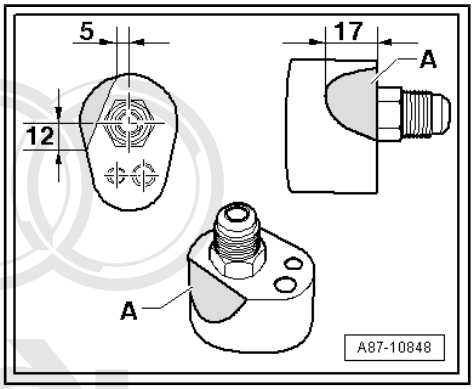
Making additional hole in adapters -VAS 6338/5- and -VAS 6338/11-

– Make a hole -A- in addition to the hole provided (the dimensions in the illustration are given in mm).

Reworking adapter -VAS 6338/3-



– By grinding or filing off material in area -A-, rework the adapter -VAS 6338/3- such that it can be connected without bending the refrigerant line (the dimensions in the illustration are given in mm).



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Audi Q7

Vehicle	Adapters required for the connections to the air conditioner compressor	Adapters required for connections to receiver / to second evaporator	Other requirements
Audi Q7 (4L_) 2006 ➤ ◆ Vehicle with one evaporator (2 zone air conditioner)	– Compressor manufacturer „Denso“ (block connections with radial seal) ◆ Adapter -VAS 6338/12- (low-pressure side) ◆ Adapter -VAS 6338/3- (high-pressure side)	– No adapter required, the dryer is removed from the receiver at the condenser and the opening sealed off again.	Expansion valve removed and adapter -VAS 6338/17- or adapter -VAS 6338/33- fitted depending on version of expansion valve (or drilled-open expansion valve e.g. 7L0 820 712 A, 7H0 820 679 B or 7L0 820 679 C fitted ⇒ page 122) ⇒ Electronic parts catalogue .
◆ Additionally for vehicles with 2 evaporators (4-zone air conditioner)		For flushing circuit with evaporator in front air conditioning unit ◆ Adapter -VAS 6338/5- for sealing connection („low-pressure side“) to second evaporator ◆ Adapter -VAS 6338/11- for sealing connection („high-pressure side“) to second evaporator)	

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Vehicle	Adapters required for the connections to the air conditioner compressor	Adapters required for connections to receiver / to second evaporator	Other requirements
		For flushing second evaporator and corresponding pipes ♦ Adapter -VAS 6338/3- for connecting the air conditioner service station to the „low-pressure end“ connection (to the second evaporator). ♦ Adapter -VAS 6338/4- for connecting the air conditioner service station to the „high-pressure end“ connection (to the second evaporator).	Expansion valve at second evaporator removed and Adapter -VAS 6338/17- fitted (or drilled-open expansion valve e.g. 7L0 820 712 A fitted ⇒ page 122) ⇒ Electronic parts catalogue

Note

On vehicles with two evaporators, the refrigerant circuit is flushed in two operations.

Audi R8

Vehicle	Adapters required for the connections to the air conditioner compressor	Adapters required for reservoir connections	Other requirements
Audi R8 (42_) 2008 ➤	– Compressor manufacturer „Denso“ (block connections with radial seal) ♦ Adapter -VAS 6338/12- (low-pressure side) ♦ Adapter -VAS 6338/3- (high-pressure side)	Reservoir – Block connections with radial seal at inlet and outlet ♦ Adapter -VAS 6338/8- (2x required)	- Restrictor removed, pipe connections re-assembled

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Note

- *On the Audi R8, the engine must be removed to renew the air conditioner compressor. For flushing the refrigerant circuit, the refrigerant pipes can however be detached without removing the air conditioner compressor ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *The two condensers are flushed in situ in the direction opposite to that of the refrigerant flow.*

5.6 Tracing leaks in refrigerant circuit

Vehicles with high-voltage system (hybrid vehicles)

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

WARNING

Working on vehicles with high-voltage wiring:

- ***Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.***
- ***High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.***
- ***The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.***

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DANGER!

Risk of fatal injury if high-voltage components are damaged.

Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

If work is necessary in the vicinity of high-voltage system components, perform a visual inspection of the high-voltage components and wiring to check for damage ⇒ page 6 and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

If work is necessary on high-voltage system components, de-energise the high-voltage system ⇒ Electrical system; Rep. gr. 93 ; De-energising high-voltage system and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

Note

The leak detection work at the refrigerant circuit using an electronic leak detector or a UV leak detector lamp can usually also be performed on the components of the high-voltage system without having to de-energise the high-voltage system.

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De-energising high-voltage system

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DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be de-energised by a suitably qualified person (Audi high-voltage technician).*
- *It must be definitely confirmed that the high-voltage system is de-energised. The system may only be de-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The qualified person (Audi high-voltage technician) confirms that the system is de-energised and uses the locking cap -T40262- to ensure that the system cannot be re-energised. The ignition key and the maintenance connector for high-voltage system - TW - should then be stored in a safe place by the qualified person.*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

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Note

- *De-energising high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - De-energise high-voltage system (Rep. gr. 93)`

Re-energising high-voltage system

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DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be re-energised by a suitably qualified person (Audi high-voltage technician).*
- *The system may only be re-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The vehicle is then made ready for operation again by the qualified person (Audi high-voltage technician).*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

Note

- *Re-energise high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management - J840`
- `8C - Hybrid battery management, functions`
- `51 - Re-energise high-voltage system (Rep. gr. 93)`

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DANGER!

When working on a vehicle with the ignition switched on or while the drive system is active, the engine can start unexpectedly and exhaust fumes can cause a health hazard in closed rooms. Moving parts can trap or draw in parts of the body and/or clothing (safety hazard).

Before switching on the ignition, perform the following steps:

- *Move selector lever to position P*
- *Activate parking brake*
- *Switch off ignition*
- *Open bonnet*
- *Connect battery charger (e.g. -VAS 5095A-) to jump-start connections of 12 V electrical system*
- *Switch on ignition*

– To minimise the number of automatic engine starts when the vehicle's drive system is active during test and measurement work, charge the vehicle batteries e.g. with the battery charger 60A -VAS 5904- in battery standby mode ⇒ Electrical system; Rep. gr. 27 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

– For test and measurement work that requires the vehicle's drive system to be active or the ignition to be switched on, move the selector lever to position „P“, activate the parking brake and arrange the tools needed so that they cannot come into contact with moving components of the engine and so that they cannot even come near to components that turn when the engine is running.

Note

- *Move the selector lever to position „P“ and activate the parking brake before performing test and measurement work for which the ignition must be switched on but where the vehicle's drive system does not need to be active.*
- *The status of the drive system is shown by the control unit in dash panel insert -J285- via the „power meter“ ⇒ Owner's Manual .*
- *Activating and deactivating drive system ⇒ Owner's Manual (note display of control unit in dash panel insert -J285-).*

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Vehicles with start/stop system

WARNING

Injury risk due to automatic engine start (vehicles with start/stop system).

- *On vehicles with an activated start/stop system (indicated by a message in the instrument cluster display), the engine may start automatically on demand.*
- *Therefore, please make sure that the start/stop system is deactivated when performing repair work on the vehicle (switch off the ignition, and switch it on again if required).*

All vehicles

Note

- *Minor leaks can be detected with an electronic leak detector or UV leak detector lamp for example.*
- *This Workshop Manual describes two ways of tracing leaks in refrigerant circuits. These procedures have been tested and lead to a reliable result under the different usage conditions if they are performed correctly and in accordance with the specific complaint.*
- *There are numerous systems available on the market for the detection of refrigerant circuit leaks. Not all of these yield unequivocable results and, if not employed in the specified manner, may indicate leaks at various refrigerant circuit components although these are actually intact. In addition, certain procedures can lead to damage to components of refrigerant circuits.*

- Components found to be leaking are to be renewed and not repaired.
- Leaking refrigerant circuits are not to be filled with refrigerant. Empty refrigerant circuits are therefore to be evacuated before filling with refrigerant and checked for leaks in this process ⇒ page 99 .

Caution

- *Audi does not permit the use of chemical substances (sealing additives) to seal leaks in the refrigerant circuit.*
- *Chemical substances for sealing leaks form deposits in the refrigerant circuit which will impair operation of the air conditioning system and lead to failure of the system (and of the air conditioner service station).*

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Note

Chemical substances (sealing additives) for sealing leaks in the refrigerant circuit generally react with the ambient air or the humidity contained in it. They cause malfunctioning of valves and other components with which they come into contact on account of deposits in the refrigerant circuit (and in the air conditioner service station being used). These deposits cannot be completely removed from the components affected (even by flushing). The refrigerant circuit can therefore only be repaired by renewing all the components which have come into contact with this substance.

- ⇒ „5.6.1 Tracing refrigerant circuit leaks with electronic leak detector (e.g. V.A.G 1796)“, page 164 .
- ⇒ „5.6.2 Tracing leaks in refrigerant circuit with leak detection system VAS 6201“, page 165 .
- ⇒ „5.6.3 Establishing leaks by way of vacuum test with air conditioner service station or nitrogen pressure test“, page 175

5.6.1 Tracing refrigerant circuit leaks with electronic leak detector (e.g. V.A.G 1796)

Vehicles with high-voltage system (hybrid vehicles)

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

All vehicles

Note

- *The various refrigerants have a different molecular structure. The sensors of the electronic leak detectors are matched to these molecules. If use is made of an electronic leak detector not specially designed for refrigerant R134a, this will not respond to refrigerant R134a or only in the event of a high refrigerant concentration in the vicinity of the leak.*
- *Depending on the design of the air conditioning unit it may be possible to determine a leak at the evaporator by inserting the test prod of the leak detector through the connection for glove compartment cooling into the air conditioning unit or - with the condensation drain hose detached - by holding the test prod at the open connection for the condensation drain of the air conditioning unit.*

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Leak detection procedure for a refrigerant circuit completely empty as a result of leakage:

Caution

Proceed as follows with a completely empty refrigerant circuit to avoid allowing more refrigerant than is absolutely necessary for leak detection to escape into the environment:

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– Evacuate the refrigerant circuit using the air conditioner service station ⇒ page 99 .

Note

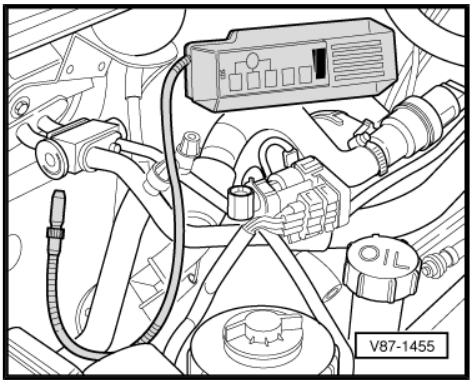
- *If evacuation already reveals a major leak, this is to be located and eliminated as described ⇒ page 99 .*
- *Continue as follows if evacuation does not reveal any leakage or if the leakage is so slight that it is not possible to determine the leakage location with the vacuum test.*

– Pour roughly 100 g of refrigerant into the evacuated refrigerant circuit and perform leak detection as for a refrigerant circuit charged with refrigerant ⇒ page 165 .

Leak detection procedure for refrigerant circuit charged with refrigerant:

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– Switch off ignition
– Start up the leak detector in line with the operating instructions.
– Always hold the probe tip under the location of the suspected leak.



If the clicking rate increases or a warning tone sounds (depends on model), this indicates that the leak has been located (refer to operating instructions for leak detector).

Note

- *Refrigerant gas is quickly dispersed by the movement of air. Draughts must therefore be avoided during leak detection.*
- *Refrigerant gas is heavier than air and therefore sinks to a lower level at the exit location.*

5.6.2 Tracing leaks in refrigerant circuit with leak detection system VAS 6201

Vehicles with high-voltage system (hybrid vehicles)

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

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All vehicles

Note

- *Certain leaks are difficult or even impossible to find using an electronic leak detector. In such cases, the leak detection system VAS 6201 can be used.*
- *Refrigerant circuit leaks result in a loss of refrigerant oil together with the refrigerant. This oil generally remains in the vicinity of the leak location. Adding a small quantity of fluorescent fluid to the refrigerant circuit makes this oil visible under UV light. The fluid (PAG oil containing an additive which shows up under UV light) is poured into the refrigerant circuit and becomes distributed with the refrigerant oil when the air conditioner is switched on.*
- *The air conditioner must be operated for at least 60 min. to distribute the additive throughout the refrigerant circuit (the air conditioner compressor must run). Depending on the extent of the leak, the leakage location may already become visible under UV light within this period.*
- *The refrigerant oil containing the additive (which shows up under UV light) can either be poured directly into the open circuit or pumped in with the circuit charged using the hand pump VAS 6201/1 (from the leak detection system VAS 6201) via the service connection on the low-pressure end.*
- *If the UV leak detection additive is applied via the service connection on the low-pressure end with the refrigerant circuit charged, a small quantity of UV leak detection additive remains in the service connection. This is to be carefully removed so as to avoid subsequent erroneous leak detection.*
- *If a component forming part of a circuit into which the UV leak detection additive is poured has to be renewed, thoroughly clean the joints with the other components after assembling the refrigerant circuit. Otherwise, the residual UV leak detection additive at the joint could be erroneously identified as a leakage location during subsequent leak localisation.*
- *On discharging the refrigerant circuit, refrigeration oil and thus also UV leak detection additive ingresses into the air conditioner service station. The refrigerant oil is removed from the refrigerant in the oil separator of the air conditioner service station and discharged from the air conditioner service station via the drain. The refrigerant oil drained off is not to be poured back in. It is to be replaced with fresh refrigerant oil.*
- *Observe the following if leak detection fluid has already been poured into a refrigerant circuit in the course of previous repair work: Only add new leak detection fluid if refrigerant oil is renewed. If only a certain amount of refrigerant oil has been renewed, just add the corresponding quantity of leak detection fluid. After renewing 100 ml of refrigeration oil on a vehicle containing 250 ml for example, just add 1 ml (cm^3) of UV leak detection additive.*
- *Certain materials and their compounds (e.g. oxidation products on aluminium components, anti-corrosion waxes) also show up under UV light.*
- *Certain types of air conditioner service station permit the direct introduction of the UV leak detection additive (heed the information given in the operating instructions of the air conditioner service station).*

Proceed as follows with a completely empty refrigerant circuit to avoid allowing more refrigerant than is absolutely necessary for

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leak detection to escape into the environment when localising refrigerant circuit leaks:

– Evacuate the refrigerant circuit using the air conditioner service station ⇒ page 99 .

Note

- *If evacuation already reveals a major leak, this is to be located and eliminated as described ⇒ page 175 and ⇒ page 99 .*
- *With the leak detection system -VAS 6201- , it is also possible to add UV leak detection additive to a charged or open refrigerant circuit ⇒ page 168 .*

Continue as follows if evacuation does not reveal any leakage or if the leakage is so slight that it is not possible to determine the leakage location on evacuation:

- Adding UV leak detection additive to the refrigerant circuit using the air conditioner service station ⇒ page 167 .
- Adding UV leak detection additive to the refrigerant circuit using the leak detection system -VAS 6201- ⇒ page 168 .

Adding UV leak detection additive to the refrigerant circuit using the air conditioner service station

– Adding UV leak detection additive and the specified quantity of refrigerant to the refrigerant circuit using the air conditioner service station ⇒ page 265 .

Note

The quantity of UV leak detection additive to be added to a refrigerant circuit with a refrigeration oil quantity of 100 to 150 cm^3 using the hand pump -VAS 6201- of the leak detection system -VAS 6201- is 2.5 $^+/_-$ 0.5 cm^3. If the quantity of refrigeration oil in the refrigerant circuit is greater, correspondingly more UV leak detection additive must be added (e.g. .5.0 $^+/_-$ 0.5 cm^3 for a refrigerant circuit with a refrigeration oil quantity of 250 cm^3. When adding the UV leak detection additive with an air conditioner service station, the amount required may differ and attention must therefore be paid to the corresponding operating instructions. For the corresponding refrigeration oil quantity in the refrigerant circuit, refer to ⇒ page 288 .

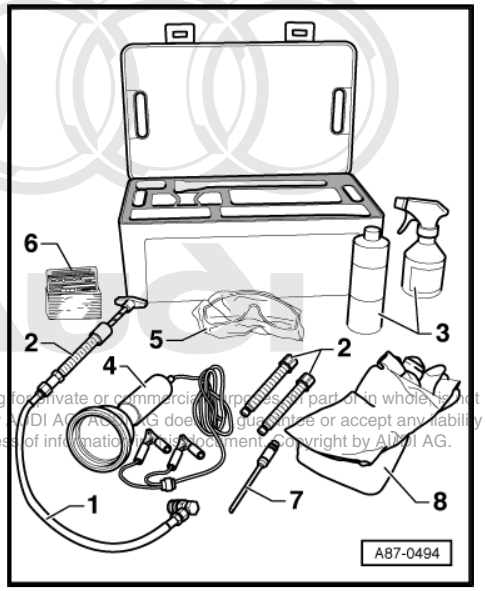
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Special tools and workshop equipment required

- Air conditioner service station with facility for adding UV leak detection additive to the refrigerant circuit ⇒ V.A.G workshop equipment catalogue
- Approved leak detection additive ⇒ V.A.G workshop equipment catalogue

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- Cleaning agent -VAS 6201/3- -3-



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- UV leak detector lamp -VAS 6201/4- -4-
- UV-absorbing safety goggles -VAS 6201/6- -5-
- Sticker -VAS 6201/7- -6-

– Affix a sticker next to the service connections to indicate that UV leak detection additive has been added to this refrigerant circuit.

– Start up the air conditioner.

Note

- *The air conditioner must be operated for at least 60 min. to distribute the additive throughout the refrigerant circuit (the air conditioner compressor must run). Depending on the extent of the leak, the leakage location may already become visible under UV light within this period.*
- *Depending on its magnitude and location, it may now take several days for sufficient refrigeration oil with UV leak detection additive to emerge to clearly localise the leakage point.*

– Use a UV lamp VAS 6196/4 to locate the refrigerant circuit leak ⇒ page 174 .

Adding UV leak detection additive to the refrigerant circuit using the leak detection system -VAS 6201-

Special tools and workshop equipment required

- Leak detection system -VAS 6201-

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The leak detection system VAS 6201 includes the following tools
⇒ V.A.G workshop equipment catalogue



1 - Hand pump with low-pressure service hose, service coupling and non-return valve -VAS 6201/1-

2 - Cartridge -VAS 6201/2- (with UV leak detection additive)

3 - Cleaning solution -VAS 6201/3-

4 - UV leak detection lamp -VAS 6201/4-

5 - UV-absorbing eye protection -VAS 6201/6-

6 - Sticker -VAS 6201/7-

7 - Tube
VAS 6201/8

8 - Protective gloves -VAS 6201/9-

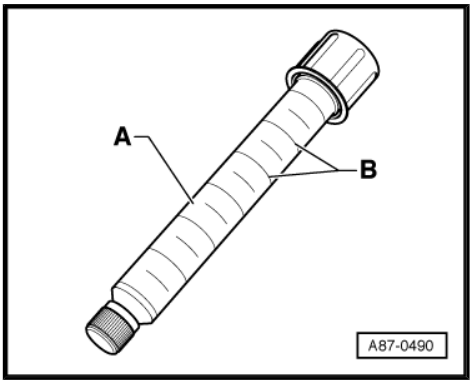
Note

- *The following procedure describes the addition of UV leak detection additive using the hand pump -VAS 6201-. Heed the corresponding operating instructions if the UV leak detection additive is to be added to the refrigerant circuit using a different tool (e.g. an air conditioner service station).*
- *Indicated in the following is the quantity of UV leak detection additive to be added to a refrigerant circuit with a refrigeration oil quantity of 100 to 150 cm^3 using the hand pump -VAS 6201- (2.5 +/- 0.5 cm^3). If the quantity of refrigeration oil in the refrigerant circuit is greater, correspondingly more UV leak detection additive must be added (e.g. .5.0 +/- 0.5 cm^3 for a refrigerant circuit with a refrigeration oil quantity of 250 cm^3. For the corresponding refrigeration oil quantity in the refrigerant circuit, refer to ⇒ page 288 .*
- *Heed the quantity of UV leak detection additive given in the corresponding operating instructions if the UV leak detection additive is to be added to the refrigerant circuit using a different tool (e.g. an air conditioner service station).*

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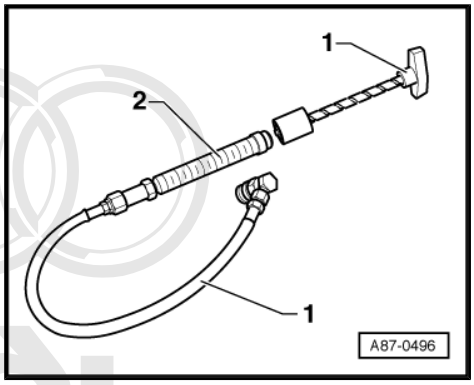
Adding UV leak detection additive with refrigerant circuit empty

The cartridge -A- contains 15.4 ml of UV leak detection additive (one unit -B- corresponds to 2.5 ml).



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– Assemble the hand pump -VAS 6201- , item -1- with the cartridge, item -2- -VAS 6201/2- .
– Insert filler tube -VAS 6201/8- (⇒ page 169 item -7-) in hand pump.
– Open hand pump service valve.



Note

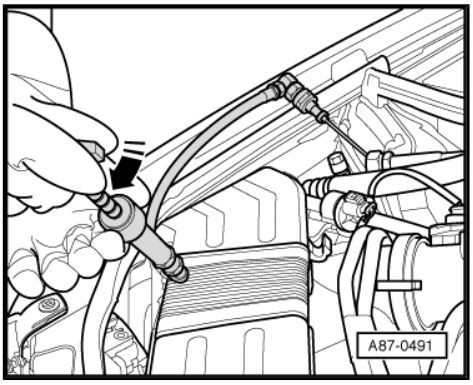
- *When the refrigerant circuit is empty, the UV leak detection additive can be added to the circuit via a service connection or an open connection.*
- *If the refrigerant circuit is empty, it may be better to add the UV leak detection additive by way of a joint (e.g. if a joint has already been unfastened). In this way, no UV leak detection additive is left in the service connection and the connection does not have to be cleaned.*

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- Addition of UV leak detection additive to the refrigerant circuit by way of a service connection ⇒ page 172 .
- Addition of UV leak detection additive to the refrigerant circuit by way of an open connection ⇒ page 171 .

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Addition of UV leak detection additive to the refrigerant circuit by way of an open connection.



– Open the refrigerant circuit at a readily accessible connection.
– Cover the surrounding area with sheeting or absorbent paper.
– Hold filler tube upwards.
– Screw in the toggle of the hand pump until the UV leak detection additive emerges from the tube.
– Add 2.5 $^{+}/_{-}$ 0.5 ml (millilitre = cm^3) of UV leak detection additive to the refrigerant circuit (for a refrigerant circuit with a refrigeration oil quantity of 100 to 150 cm^3).

Note

Observe the following if UV leak detection fluid has already been poured into a refrigerant circuit in the course of previous repair work: Only add new UV leak detection fluid if refrigerant oil is renewed. If only a certain amount of refrigeration oil has been renewed, just add the corresponding quantity of UV leak detection additive. After renewing 100 ml of refrigeration oil on a vehicle containing 250 ml for example, just add 2 ml (cm^3) of UV leak detection additive.

– Renew O-ring at open connection.
– Assemble refrigerant circuit.
– Affix a sticker next to the service connections to indicate that leak detection fluid has been added to this refrigerant circuit.
– Evacuate and charge the refrigerant circuit as specified ⇒ page 99 and ⇒ page 103 .
– Start up the air conditioner.

Note

- *The air conditioner must be operated for at least 60 min. to distribute the additive throughout the refrigerant circuit (the air conditioner compressor must run). Depending on the extent of the leak, the leakage location may already become visible under UV light within this period.*
- *Depending on its magnitude and location, it may now take several days for sufficient refrigerant oil with additive to emerge to clearly localise the leakage point.*

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– Use a UV lamp VAS 6196/4 to locate the refrigerant circuit leak ⇒ page 174 .

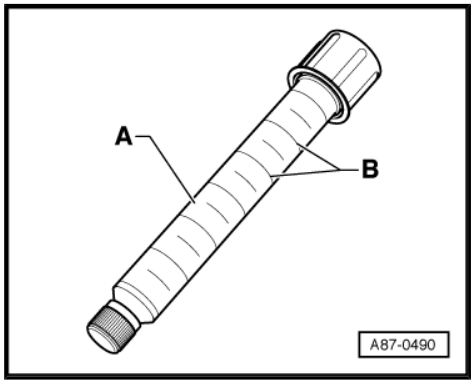
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Adding UV leak detection additive with refrigerant circuit charged

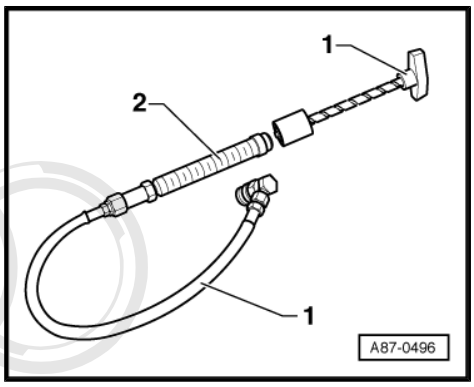
Note

- *Observe the following if leak detection fluid has already been poured into a refrigerant circuit in the course of previous repair work: Only add new leak detection fluid if refrigerant oil is renewed. If only a certain amount of refrigeration oil has been renewed, just add the corresponding quantity of leak detection fluid. After renewing 100 ml of refrigeration oil on a vehicle containing 250 ml for example, just add 1 ml (cm^3) of UV leak detection additive.*
- *A small quantity of UV leak detection additive remains in the service connection. This is to be carefully removed so as to avoid subsequent erroneous leak detection.*

The cartridge -A- contains 15.4 ml of UV leak detection additive (one unit -B- corresponds to 2.5 ml).



- Switch off ignition.
- Detach cap from service connection on low-pressure end of refrigerant circuit.
- Assemble the hand pump -VAS 6201- , item -1- with the cartridge, item -2- -VAS 6201/2- .
- Insert the tube -VAS 6201/8- (⇒ page 169 item -7-) in the service coupling and open the service coupling by screwing in the handwheel. Hold the hose upwards and screw in the toggle of the hand pump until the UV leak detection additive starts to emerge from the tube.



Note

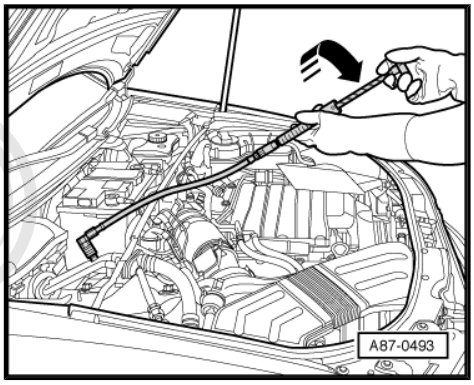
Make sure hand pump hose is completely filled with refrigerant.

- Close service coupling and remove filler tube from locking mechanism.

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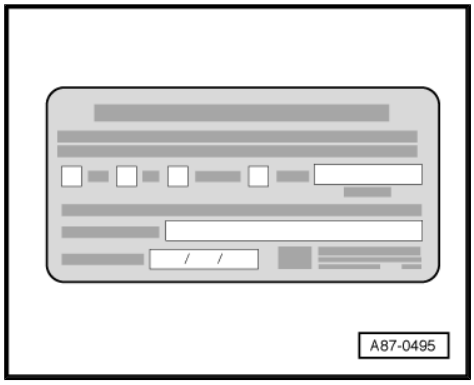
– Cover the area around the service connection on the vehicle with sheeting or absorbent paper.
– Connect the filler unit to the refrigerant circuit service connection on the vehicle.
– Open the service connection by screwing in the handwheel.
– By screwing in the toggle of the hand pump, add 2.5 $^{+}$/- 0.5 ml (millilitre = cm^3) of UV leak detection additive to the refrigerant circuit (for a refrigerant circuit with a refrigeration oil quantity of 100 to 150 cm^3).



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– Detach the filler unit from the service connection.
– Use absorbent paper, for example, to remove the residual UV leak detection additive from the service connection.
– Seal the service connection with the cap.
– If necessary, use cleaning solution to clean area around service connection.
– Affix a sticker next to the service connections to indicate that leak detection fluid has been added to this refrigerant circuit.
– Start up the air conditioner.



Note

- *The air conditioner must be operated for at least 60 min. to distribute the additive throughout the refrigerant circuit (the air conditioner compressor must run). Depending on the extent of the leak, the leakage location may already become visible under UV light within this period.*
- *Depending on its magnitude and location, it may now take several days for sufficient refrigerant oil with additive to emerge to clearly localise the leakage point.*

– Use a UV lamp VAS 6196/4 to locate the refrigerant circuit leak ⇒ page 174 .

Locating refrigerant circuit leaks with UV lamp VAS 6196/4

WARNING

Never look into the UV lamp.

Never point the UV lamp at other people.

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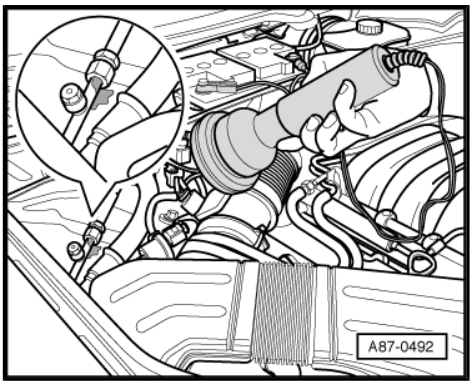
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Note

- *After adding the UV leak detection additive, the air conditioner must be operated for at least 60 min. to distribute the additive throughout the refrigerant circuit (the air conditioner compressor must run). Depending on the extent of the leak, the leakage location may already become visible under UV light within this period.*
- *Depending on its magnitude and location, it may take several days for sufficient refrigerant oil with additive to emerge to clearly localise the leakage point.*
- *In the event of leaks at the evaporator, the additive may be washed out with the condensate and emerge via the condensate drain. As considerable work is required on most vehicles to gain access to the evaporator, a check at the condensate drain for example can provide an indication of evaporator leakage. This does however require the additive to have been in the refrigerant circuit for a lengthy period (several days).*
- *The safety goggles are not only designed to provide eye protection. They also make the UV leak detection additive more readily visible under UV light.*
- *Depending on the accessibility of various parts of the refrigerant circuit, it may be necessary to remove certain vehicle components (e.g. the bumper or air cleaner).*
- *Certain parts of the refrigerant circuit are only supplied with a small quantity of refrigerant oil in the course of air conditioner operation (e.g. top-mounted cap of receiver attached to condenser on Audi A8 2010 >). In the event of leakage at such locations, it may take longer for a sufficient amount of refrigerant with refrigerant oil and additive which shows up under ultraviolet light to emerge for leak detection. In such areas it may therefore be appropriate to use an electronic leak detector for leak localisation*
  ⇒ „5.6.1 Tracing refrigerant circuit leaks with electronic leak detector (e.g. V.A.G 1796)“, page 164

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– Move the vehicle to a poorly lit area of the workshop (daylight or bright artificial lighting diminishes the effect of the UV light).
– Check the accessibility of the various parts of the refrigerant circuit and remove any components in the surrounding area which prevent a clear view of the refrigerant circuit components (e.g. noise insulation and bumper).
– Wear safety goggles to protect the eyes.
– Connect the UV lamp to a 12 V battery (vehicle battery). Take care to ensure correct polarity of connections.
– Switch on the UV lamp and illuminate the components of the refrigerant circuit. Locations at which leakage has resulted in the emergence of refrigerant, refrigeration oil and thus also UV leak detection additive show up under UV light (fluorescent).



5.6.3 Establishing leaks by way of vacuum test with air conditioner service station or nitrogen pressure test

Vehicles with high-voltage system (hybrid vehicles)

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ;

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General warning instructions for work on the high-voltage system .

All vehicles

– Switch off ignition.

- Establishing leaks by way of vacuum test with air conditioner service station or nitrogen pressure test
⇒ „5.3.4 Evacuating refrigerant circuit with air conditioner service station“, page 99

Note

- *Minor refrigerant circuit leaks (loss amounting to less than 100 g of refrigerant per year) can generally not be established by way of the vacuum test or nitrogen pressure test. The quantity of air ingressing or nitrogen escaping is not sufficient to be audible.*
- *Depending on the ambient conditions (ambient noise, leakage location etc.), it may also not always be possible to establish refrigerant circuit leaks involving a loss of more than 100 g of refrigerant per year using the vacuum or nitrogen pressure test. The amount of air ingressing or nitrogen escaping may not be sufficient to produce a noise permitting detection of the fault location.*
- *Depending on the ambient conditions, it may be possible to detect major refrigerant circuit leaks (e.g. caused by flying stones at the condenser, loss of refrigerant more than 100 g per day) from the noise occurring at the fault location during the vacuum or nitrogen pressure test for example*
⇒ „5.3.4 Evacuating refrigerant circuit with air conditioner service station“, page 99 .

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6 Problems with refrigerant circuit

- Possible complaints about refrigerant circuit ⇒ page 177

6.1 Possible complaints about refrigerant circuit

- Test requirements ⇒ page 177
- Possible complaints ⇒ page 177

6.1.1 Test requirements

- Electrical system, vacuum system and air duct fault finding has not revealed any faults ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner), ⇒ Current flow diagrams, Electrical fault finding and Fitting locations and ⇒ Heating, air conditioning or ⇒ Air conditioning .
- Air conditioner self-diagnosis/Guided Fault Finding with the ⇒ Vehicle diagnostic tester has not revealed any faults, no compressor shut-off criteria displayed in measured value block (vehicles with „air conditioner“ self-diagnosis only) ⇒ Heating, air conditioning or ⇒ Air conditioning or „Guided Fault Finding“ function ⇒ Vehicle diagnostic tester .

6.1.2 Possible complaints

Note

- *For all problems marked *, refer to ⇒ page 188 „Checking pressures“.*
- *If problems are only encountered at one evaporator on vehicles fitted with two evaporators, also check the pressures in the refrigerant circuit.*
- *Observe test requirements ⇒ page 177 .*

- Total cooling system failure.*
- Insufficient cooling output at all vehicle or engine speeds.*
- No or insufficient cooling after driving a few miles. *
- No or insufficient cooling at one or via both evaporators (on vehicles with two air conditioning units). *
- Air conditioner compressor, air conditioning system magnetic clutch -N25- or air conditioner compressor regulating valve -N280- shut off by a pressure switch (e.g. -F73-, -F118-, -F129- -F129- or by the operating and display unit for Climatronic air conditioning system -E87- or the Climatronic control unit -J255-) on account of excessive or inadequate pressure. *
- No or sharp decrease in fresh-air supply after driving several miles (evaporator iced up). *

In addition, the following problems may occur:

Air conditioner compressor noise

– Re-tighten the bolts for the air conditioner compressor and the compressor holder using a torque wrench.

– Check the routing of the refrigerant lines; they must not touch other components and must not be subject to strain (align if necessary).

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Noise (refrigerant hammer) occurring immediately after switching on the air conditioner and/or when cornering or braking

– Discharge, evacuate and re-charge the refrigerant circuit (too much refrigerant in circuit).

Note

Too much refrigerant oil in the circuit may also result in this problem (no adjustment of refrigerant oil quantity, for example, on renewing compressor).

Water sprays out of the vents (in the dash panel or footwell) although the air conditioning system is otherwise functioning properly

– Check proper routing of the condensation drain; it must not be crushed or kinked.

– Check the condensation drain valve; it must not be gummed up with wax or underseal and must close properly.

– Check the plenum chamber cover; it must not be damaged and must be properly installed (to stop water running into the evaporator).

– Check the plenum chamber water drains; they must not be blocked (e.g. by leaves).

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7 Connecting air conditioner service station

Vehicles with high-voltage system (hybrid vehicles)

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

WARNING

Working on vehicles with high-voltage wiring:

- *Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.*
- *High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.*
- *The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.*

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DANGER!

Risk of fatal injury if high-voltage components are damaged.

Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

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If work is necessary in the vicinity of high-voltage system components, perform a visual inspection of the high-voltage components and wiring to check for damage ⇒ page 6 and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

If work is necessary on high-voltage system components, de-energise the high-voltage system ⇒ Electrical system; Rep. gr. 93 ; De-energising high-voltage system and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

Note

When working on the refrigerant circuit using the air conditioner service station, the high-voltage system does not usually have to be de-energised.

De-energising high-voltage system

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DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be de-energised by a suitably qualified person (Audi high-voltage technician).*
- *It must be definitely confirmed that the high-voltage system is de-energised. The system may only be de-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The qualified person (Audi high-voltage technician) confirms that the system is de-energised and uses the locking cap -T40262- to ensure that the system cannot be re-energised. The ignition key and the maintenance connector for high-voltage system - TW - should then be stored in a safe place by the qualified person.*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

Note

- *De-energising high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - De-energise high-voltage system (Rep. gr. 93)`

Re-energising high-voltage system

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DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- ***Voltage levels in the high-voltage system constitute a safety hazard.***
- ***For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.***
- ***The high-voltage system may only be re-energised by a suitably qualified person (Audi high-voltage technician).***
- ***The system may only be re-energised using the vehicle diagnostic tester via „Guided Fault Finding".***
- ***The vehicle is then made ready for operation again by the qualified person (Audi high-voltage technician).***
- ***The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.***

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Note

- *Re-energise high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - Re-energise high-voltage system (Rep. gr. 93)`

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DANGER!

When working on a vehicle with the ignition switched on or while the drive system is active, the engine can start unexpectedly and exhaust fumes can cause a health hazard in closed rooms. Moving parts can trap or draw in parts of the body and/or clothing (safety hazard).

Before switching on the ignition, perform the following steps:

- *Move selector lever to position P*
- *Activate parking brake*
- *Switch off ignition*
- *Open bonnet*
- *Connect battery charger (e.g. -VAS 5095A-) to jump-start connections of 12 V electrical system*
- *Switch on ignition*

– To minimise the number of automatic engine starts when the vehicle's drive system is active during test and measurement work, charge the vehicle batteries e.g. with the battery charger 60A -VAS 5904- in battery standby mode ⇒ Electrical system; Rep. gr. 27 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

– For test and measurement work that requires the vehicle's drive system to be active or the ignition to be switched on, move the selector lever to position „P“, activate the parking brake and arrange the tools needed so that they cannot come into contact with moving components of the engine and so that they cannot even come near to components that turn when the engine is running.

Note

- *Move the selector lever to position „P“ and activate the parking brake before performing test and measurement work for which the ignition must be switched on but where the vehicle's drive system does not need to be active.*
- *The status of the drive system is shown by the control unit in dash panel insert -J285- via the „power meter“ ⇒ Owner's Manual .*
- *Activating and deactivating drive system ⇒ Owner's Manual (note display of control unit in dash panel insert -J285-).*

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Vehicles with start/stop system

WARNING

Injury risk due to automatic engine start (vehicles with start/stop system).

- *On vehicles with an activated start/stop system (indicated by a message in the instrument cluster display), the engine may start automatically on demand.*
- *Therefore, please make sure that the start/stop system is deactivated when performing repair work on the vehicle (switch off the ignition, and switch it on again if required).*

All vehicles

– Switch off ignition.

- Air conditioner service station connection on vehicles with a connection on the low and high-pressure end of the refrigerant circuit ⇒ page 184 .
- Air conditioner service station connection on vehicles with no connection on the low-pressure end of the refrigerant circuit ⇒ page 184 .

7.1 Connecting air conditioner service station on vehicles with a connection on the low and high-pressure end of the refrigerant circuit

Connecting air conditioner service station for measuring and testing

– Switch off ignition.

– Connect air conditioner service station to power supply.

– Connect quick-release coupling adapters to the charging hoses of the air conditioner service station (handwheels not screwed in/hand shut-off valve not open).

– Switch on the air conditioner service station and evacuate the charging hoses (only necessary if there is air in the charging hoses).

– Switch off air conditioner service station.

– Unscrew sealing caps from service connections (with valve).

– Connect up the air conditioner service station via the service connections with quick-release coupling adapters to the vehicle refrigerant circuit.

– Only screw in the handwheel of the quick-release coupling adapters to the extent required to reliably open the valves at the refrigerant circuit connection (observe pressure gauge, do not open valves further than necessary).

– Perform planned tests and measurements.

7.2 Connecting air conditioner service station on vehicles with no connection on the low-pressure end of the refrigerant circuit

On the following vehicles, no service connection is provided for the air conditioner service station on the low-pressure end of the

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refrigerant circuit. Adapters are required for connecting the air conditioner service station to the refrigerant circuit of these vehicles.

- Audi 80, Audi Cabriolet, Audi Coupé
- Audi A4 up to 07.96
- Audi 100 / Audi A6 up to 03.97
- Audi A8 up to 11.97

Note

On vehicles with no or an inaccessible connection at the air conditioner compressor, remove the low-pressure switch for air conditioning system -F73- (jumper the contacts in the connector for the low-pressure switch for air conditioning system -F73-) and screw an adapter to this connection ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

Note

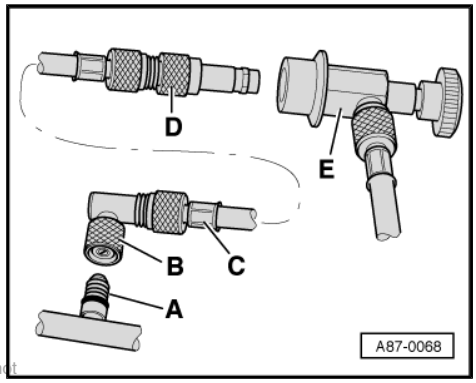
- *The tools listed below are commercially available or can be obtained from the regional sales centre or importer.*
- *Should it be necessary to measure pressures at switch connections on high-pressure side, use adapter from adapter set for refrigerant circuit -V.A.G 1785/9- and proceed in the same manner.*

- Connecting air conditioner service station to refrigerant circuit with adapter set for refrigerant circuit -V.A.G 1786- ⇒ page 186
- Connecting air conditioner service station to refrigerant circuit with adapter V.A.G 1785/10 ⇒ page 186
- Connecting air conditioner service station for measuring and testing ⇒ page 187

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7.2.1 Connecting air conditioner service station to refrigerant circuit with adapter set for refrigerant circuit -V.A.G 1786-



A - Connection with valve (small valve core) at low-pressure side of refrigerant circuit

B - Adapter with union nut -V.A.G 1786/1-

C - Commercially available filler hose (short version with 5/8" thread on each end)

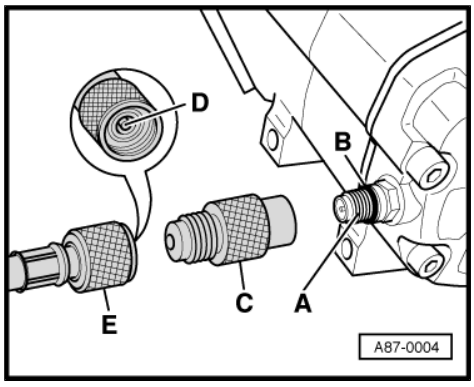
D - Adapter with service connection -V.A.G 1786/2- (for connection of quick-release coupling of air conditioner service station -E-)

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Note

- *Assemble adapter and filler hose as shown and start by connecting to connection with valve -A-.*
- *The adapter with union nut -V.A.G 1786/1- is only to be used at connections with a „small“ valve core (standard for connection with valve for low-pressure switch for air conditioning system -F73- and also gradually introduced as of 10.94 at the air conditioner compressor).*
- *Instead of adapter with union nut -V.A.G 1786/1- , you can also use adapter -V.A.G 1785/10- (remove valve from adapter -V.A.G 1785/10- or install valve opener in filler hose).*

7.2.2 Connecting air conditioner service station to refrigerant circuit with adapter V.A.G 1785/10



– Unscrew the sealing cap from the connection with valve -A- (at the air conditioner compressor).
– Attach O-ring -B- to connection (8.9 mm; 1.8 mm).
– Screw adapter V.A.G 1785/10 -C- onto connection -B-.
– Install valve opener -D- with appropriate seal in filler hose connection.

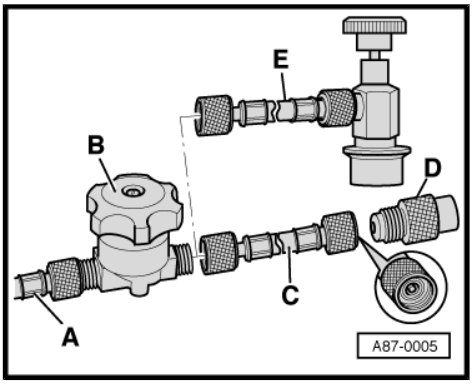
Note

- *The type of valve opener -D- and seals required depends on the filler hose used (specific to manufacturer).*
- *The quick-release coupling adapter is not required for connection on the low-pressure end of Audi vehicles.*
- *Screw filler hose -E- (to air conditioner service station) onto adapter - V.A.G 1785/10- .*

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Note

To minimise the amount of air and moisture ingressing into the charging hoses and thus into the refrigerant circuit, the charging hoses should be connected together as illustrated.



A - Filler hose to air conditioner service station

B - Hand shut-off valve

C - Filler hose (short version) with valve opener for connection to adapter -D-

D - Adapter - V.A.G 1785/10-

E - Filler hose (short version) with quick-release coupling adapter (for vehicles with quick-release coupling adapter on low-pressure side)

– Perform planned tests and measurements.

7.2.3 Connecting air conditioner service station for measuring and testing

– Switch off ignition.

– Connect air conditioner service station to power supply.

– Assemble adapter set and screw onto connection on low-pressure side.

– Connect quick-release coupling adapters to the charging hoses of the air conditioner service station (handwheels not screwed in/hand shut-off valve not open).

– Switch on the air conditioner service station and evacuate the charging hoses (only necessary if there is air in the charging hoses).

– Switch off air conditioner service station.

– Unscrew the sealing cap from the service connection or the connection with valve (or remove the low-pressure switch and jumper the corresponding electrical connections).

– Connect up the air conditioner service station via the service connections with quick-release coupling adapters to the vehicle refrigerant circuit.

– Only screw in the handwheel of the quick-release coupling adapters to the extent required to reliably open the valve at the refrigerant circuit connection (observe pressure gauge, do not open valve too far).

– Perform planned tests and measurements.

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8 Checking pressures

Vehicles with high-voltage system (hybrid vehicles)

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

WARNING

Working on vehicles with high-voltage wiring:

- *Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.*
- *High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.*
- *The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.*

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DANGER!

Risk of fatal injury if high-voltage components are damaged.

Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

If work is necessary in the vicinity of high-voltage system components, perform a visual inspection of the high-voltage components and wiring to check for damage ⇒ page 6 and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

If work is necessary on high-voltage system components, de-energise the high-voltage system ⇒ Electrical system; Rep. gr. 93 ; De-energising high-voltage system and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

Note

When working on the refrigerant circuit using the air conditioner service station (here: checking pressure), the high-voltage system does not usually have to be de-energised.

De-energising high-voltage system

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DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be de-energised by a suitably qualified person (Audi high-voltage technician).*
- *It must be definitely confirmed that the high-voltage system is de-energised. The system may only be de-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The qualified person (Audi high-voltage technician) confirms that the system is de-energised and uses the locking cap -T40262- to ensure that the system cannot be re-energised. The ignition key and the maintenance connector for high-voltage system - TW - should then be stored in a safe place by the qualified person.*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

Note

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- *De-energising high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - De-energise high-voltage system (Rep. gr. 93)`

Re-energising high-voltage system

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Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be re-energised by a suitably qualified person (Audi high-voltage technician).*
- *The system may only be re-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The vehicle is then made ready for operation again by the qualified person (Audi high-voltage technician).*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

Audi
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Note

- *Re-energise high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
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- `51 - Re-energise high-voltage system (Rep. gr. 93)`

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DANGER!

When working on a vehicle with the ignition switched on or while the drive system is active, the engine can start unexpectedly and exhaust fumes can cause a health hazard in closed rooms. Moving parts can trap or draw in parts of the body and/or clothing (safety hazard).

Before switching on the ignition, perform the following steps:

- *Move selector lever to position P*
- *Activate parking brake*
- *Switch off ignition*
- *Open bonnet*
- *Connect battery charger (e.g. -VAS 5095A-) to jump-start connections of 12 V electrical system*
- *Switch on ignition*

– To minimise the number of automatic engine starts when the vehicle's drive system is active during test and measurement work, charge the vehicle batteries e.g. with the battery charger 60A -VAS 5904- in battery standby mode ⇒ Electrical system; Rep. gr. 27 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

– For test and measurement work that requires the vehicle's drive system to be active or the ignition to be switched on, move the selector lever to position „P“, activate the parking brake and arrange the tools needed so that they cannot come into contact with moving components of the engine and so that they cannot even come near to components that turn when the engine is running.

Note

- *Move the selector lever to position „P“ and activate the parking brake before performing test and measurement work for which the ignition must be switched on but where the vehicle's drive system does not need to be active.*
- *The status of the drive system is shown by the control unit in dash panel insert -J285- via the „power meter“ ⇒ Owner's Manual .*
- *Activating and deactivating drive system ⇒ Owner's Manual (note display of control unit in dash panel insert -J285-).*

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Vehicles with start/stop system

WARNING

Injury risk due to automatic engine start (vehicles with start/stop system).

- *On vehicles with an activated start/stop system (indicated by a message in the instrument cluster display), the engine may start automatically on demand.*
- *Therefore, please make sure that the start/stop system is deactivated when performing repair work on the vehicle (switch off the ignition, and switch it on again if required).*

All vehicles

- Check the pressures in the refrigerant circuit (with the air conditioner service station) with the ignition switched off ⇒ page 194 .
- Checking pressures on vehicles with a restrictor and reservoir (with internally regulated air conditioner compressor) ⇒ page 199
- Checking pressures on vehicles with an expansion valve and receiver (with internally regulated air conditioner compressor) ⇒ page 203
- Checking pressures on vehicles with restrictor, reservoir and air conditioner compressor regulating valve -N280- (externally regulated air conditioner compressor) ⇒ page 209
- Checking pressures on vehicles with expansion valve, receiver and air conditioner compressor regulating valve -N280- (externally regulated air conditioner compressor) ⇒ page 217
- Checking pressures on vehicles with an electrically driven air conditioner compressor (vehicles with hybrid drive) ⇒ page 226

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8.1 Checking pressures in refrigerant circuit with air conditioner service station (with ignition switched off)

Note

- *All test requirements marked with an * are vehicle-specific and are described in the Workshop Manual for the relevant vehicle.*
- *Check cooling output.*
- *Connections with valve and service connections for measurement and testing ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *Depending on the version of the air conditioner compressor, the high-pressure end of the air conditioner compressor may be fitted with a valve to prevent the backflow of liquid refrigerant into the compressor after switching off the air conditioning system. If an air conditioner compressor with this valve is fitted on a vehicle with a refrigerant circuit with an expansion valve, a relatively long period may elapse before the pressure on the high-pressure end decreases (the expansion valve is cold and the pressure on the low-pressure end increases rapidly after switch-off, the expansion valve closes and the refrigerant can only flow slowly to the low-pressure end). If the air conditioner compressor is switched on, the pressure on the low-pressure end decreases, the expansion valve opens and the refrigerant can flow to the low-pressure end.*

Under certain operating conditions, residual moisture in the coolant circuit may lead to the formation of ice at the air conditioner compressor regulating valve. Such ice formation impedes the control of the air conditioner compressor. The evaporator is cooled down too much and ices up. An iced-up evaporator may cause the following problems:

- The air conditioner fails repeatedly or sporadically (no cooling/heating output) after long journeys; after the ignition is switched off and waiting a short while, the air conditioner functions properly again.
- Misting up of the windows on the inside after a long journey; the windows are initially not cleared even by pressing the De-frost button; the air conditioner functions properly again after a short delay following engine shut-off.

Remedy:

– In the case of vehicles as of Model Year 2001 and an air conditioner compressor with air conditioner compressor regulating valve -N280- , check the measured value of the evaporator output temperature sender -G263- (by way of the „Reading measured value block“ function). If the sender measured value is too low under the usage conditions outlined by the customer (at ambient temperature above 0 °C, colder than 0 °C for a lengthy period although -N280- is currently not being actuated) or too high (greater than approx. 10 °C although the air conditioner is functioning properly), the evaporator may ice up due to the incorrect measured value ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

– On vehicles without a evaporator output temperature sender -G263- use for example footwell vent temperature sender -G192- to check vent temperature under operating conditions described by customer in the following settings: "Lo tempera-

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ture" for driver's and passenger's side, 4 or 5 bars for fresh-air blower speed, air outlet to footwell and fresh-air mode. If the measured value of the sender is too low (at ambient temperature above 0 °C, colder than 0 °C for lengthy period).

– Check refrigerant pipe between evaporator and reservoir (thick pipe, low-pressure side) with engine running. If this pipe is severely iced up when the problem occurs (a thin ice layer is permissible), this is a further indication that the temperature in the evaporator is too low.

– Discharge refrigerant circuit, renew reservoir or receiver with dryer and then evacuate refrigerant circuit for at least 3 hours.

♦ Test requirements ⇒ page 195

♦ Checking pressures ⇒ page 196 .

♦ Continuation of testing depending on design of refrigerant circuit ⇒ page 198

8.1.1 Test requirements

- Radiator and condenser clean (clean if necessary)
- Thermal insulation at expansion valve OK and properly installed.*
- The ribbed belt is OK and properly tensioned. / belts for air conditioner compressor and alternator OK and properly tensioned.*
- All air ducts, covers and seals OK and properly installed.
- Electrical system and vacuum system fault finding has not revealed any faults* ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).
- Air conditioner self-diagnosis has not revealed any faults (with engine running and air conditioner switched on), no compressor shut-off criteria displayed in measured value block (vehicles with „air conditioner“ self-diagnosis only) * ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).
- Air flow through dust and pollen filter not impeded by dirt*
- Air conditioning unit not drawing in secondary air at maximum fresh-air blower speed; evaporator and heater not drawing in secondary air at maximum fresh-air blower speed*
- Air flaps in air conditioning unit, heater and evaporator reach end position*
- Fresh-air intake ducts beneath bonnet and in passenger compartment as well as corresponding water drain valves OK* ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).
- Engine at operating temperature
- Vehicle not exposed to sunlight ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).
- Ambient temperature above 15 ° C
- All dash panel vents open.

– Start engine.

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Setting at the operating and display unit for Climatronic air conditioning system -E87- or the Climatronic control unit -J255- (and the rear Climatronic operating and display unit -E265- on vehicles with two air conditioner units):

– Preselect „Auto“ mode (air conditioner compressor on).

– Set „LO“ temperature for driver's and front passenger's side (and rear left and right on vehicles with two air conditioner units).

Settings on heater controls:

– Press A/C button and "Rec" or air recirculation button.

– Turn the rotary temperature control towards the „cold“ stop.

– Set rotary fresh-air blower control to „4“.

Subsequently, the following system test requirements should be met:

- Operation of radiator fan(s) -V7- (at least speed 1).*

Note

With some versions, the fan is not switched on until the pressure in the refrigerant circuit has exceeded a specified value.

- Fresh air blower -V2- (and rear fresh air blower -V80- on vehicles with two air conditioning units) run(s) at maximum speed.
- Recirculated/fresh-air flap set to „Recirculated air mode“ (within 1 min. after starting vehicle, air-flow flap is closed and recirculated-air flap opened)*
- Coolant shut-off valve closed.*
- Valves of pump valve unit closed and no coolant circulation pump delivery.*
- Air conditioner compressor is actually driven (air conditioning system magnetic clutch -N25- energised, overload safeguard (if fitted) not tripped).*

Note

Depending on the engine, the air conditioner compressor is driven by different components (belt or drive shaft). To protect these components and the engine, the pulley or the air conditioner compressor drive unit is fitted with an overload safeguard which is tripped if the air conditioner compressor is not operating smoothly ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

8.1.2 Checking pressures

♦ Observe test requirements ⇒ page 195 .

– Switch off ignition.

– Connect air conditioner service station ⇒ page 179 .

– Read pressures off pressure gauges; there are two possible results:

♦ The pressure in the refrigerant circuit is lower than indicated in the table.

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- The pressure in the refrigerant circuit corresponds to that indicated in the table or is higher.

Ambient temperature (in degrees centigrade)	Pressure in refrigerant circuit in bar
+15 °C	3.9
+20 °C	4.7
+25 °C	5.6
+30 °C	6.7
+35 °C	7.8
+40 °C	9.1
+45 °C	10.5

Note

- *Temperature of refrigerant circuit components should be equal to ambient temperature (the pressure will deviate from the values in the table if individual components of the refrigerant circuit are warmer or colder).*
- *On the absolute pressure scale, 0 bar corresponds to an absolute vacuum. The normal ambient pressure corresponds to 1 bar absolute. On the scales of most pressure gauges, 0 bar corresponds to an absolute pressure of 1 bar (can be seen from -1 bar mark below 0).*
- *On vehicles with a high-pressure sender -G65- or refrigerant pressure and temperature sender -G395- for which the measured pressure is displayed in the measured value block, the pressure measured should coincide with the values in the table ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *Pressure can be measured in various units: 1 MPa (megapascal) is equivalent to 10 bar gauge pressure, or 145 psi; 1 bar absolute pressure is the same as 0 bar gauge pressure, which is roughly equivalent to atmospheric pressure.*

The pressure in the refrigerant circuit is lower than indicated in the table.

Not enough refrigerant in circuit

– Determine refrigerant circuit leaks ⇒ page 158 .

– Check high-pressure safety valve.

If the high-pressure safety valve has blown off:

– Check actuation of the radiator fans.

– Check for constricted refrigerant line and hose cross-sections caused by inadequate bending radii.

– Check refrigerant pipes and hoses for external damage.

– If no fault is found, clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106).

The pressure in the refrigerant circuit corresponds to that indicated in the table or is higher.

– Start engine.

– Set air conditioning system to maximum cooling output.

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Note

On vehicles with an air conditioner compressor regulating valve -N280- , the control current can be read out in the measured value block ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

If the air conditioner compressor is not driven when the engine is running or the regulating valve is not actuated:

– Establish and eliminate the cause e.g. by interrogating the air conditioner event recorder.

– Observe test requirements.

– Check the power supply for the air conditioning system magnetic clutch -N25- . If this is OK, service the magnetic clutch.

– Check actuation of the air conditioner compressor regulating valve -N280- ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

Note

- *If the low-pressure switch has been removed to connect the air conditioner service station, jumper the electrical connections in the relevant connector for pressure measurement.*
- *The air conditioner compressor is driven by the engine via the air conditioning system magnetic clutch -N25- .*
- *The air conditioner compressor regulating valve -N280- is actuated by the operating and display unit for Climatronic air conditioning system -E87- or the Climatronic control unit -J255- ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- Continuation of testing depending on design of refrigerant circuit ⇒ page 198

8.1.3 Continuation of testing depending on design of refrigerant circuit

- Checking pressures on vehicles with a restrictor and reservoir (with internally regulated air conditioner compressor) ⇒ page 199
- Checking pressures on vehicles with an expansion valve and receiver (with internally regulated air conditioner compressor) ⇒ page 203
- Checking pressures on vehicles with restrictor, reservoir and air conditioner compressor regulating valve -N280- (with externally regulated air conditioner compressor) ⇒ page 209
- Checking pressures on vehicles with expansion valve, receiver and air conditioner compressor regulating valve -N280- (with externally regulated air conditioner compressor) ⇒ page 217

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8.2 Checking pressures on vehicles with a restrictor and reservoir (with internally regulated air conditioner compressor)

Note

- *Connect air conditioner service station ⇒ page 179 .*
- *Observe test requirements ⇒ page 188 .*

– Check the pressures in the refrigerant circuit (with the air conditioner service station) with the ignition switched off ⇒ page 194 .

The pressures with the ignition switched off correspond to the specifications.

– Start engine.

– Set engine speed to 2000 rpm.

– Observe the pressure reading (e.g. pressure gauge) of the air conditioner service station.

Note

- *Switching pressures for refrigerant circuit switches are vehicle-specific.*
- *The connection with valve for the low-pressure switch or at the evaporator is only to be used for vehicles with no service connection on the low-pressure end and an inaccessible connection at the air conditioner compressor or reservoir (measurement accuracy). Only applies to certain vehicles ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*

- Specifications for pressures in refrigerant circuit ⇒ page 199

8.2.1 Specifications for pressures in refrigerant circuit

High-pressure side:

Increasing from initial pressure (on connecting pressure gauges) up to max. 20 bar

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Low-pressure side:

Decreasing from initial pressure (on connecting pressure gauges) to value in graph

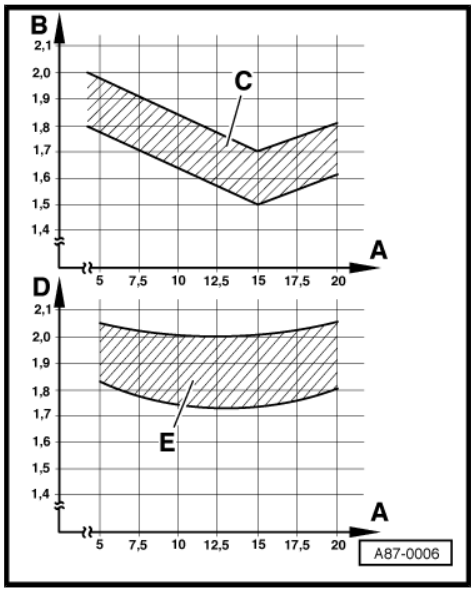
A - High pressure (measured at service connection) in bar

B - Low pressure (measured at connection with valve at air conditioner compressor or reservoir) in bar

C - Permissible tolerance range

D - Low pressure (measured at connection with valve for low-pressure switch or at service connection) in bar

E - Permissible tolerance range



Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure remains constant or only increases slightly (above pressure with engine stopped) • Low pressure quickly drops to value in graph or below • Required cooling output is not attained	Not enough refrigerant in circuit	– Localise leak with leak detector and eliminate – Re-charge refrigerant circuit.
• High pressure normal • Low pressure in line with value in graph • Required cooling output is not attained		
• High pressure normal • Low pressure too low (see graph) • Required cooling output is not attained		

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Note

If no fault is found for this problem, clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106).

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure does not increase or only to slightly above the pressure with the engine stopped, • low pressure does not decrease or only slightly. • Required cooling output is not attained	♦ No actuation of the air conditioner compressor (magnetic clutch). ♦ The air conditioner compressor is not driven.	– Check actuation and drive of the air conditioner compressor and perform repair ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 .
	♦ Constriction or blockage in the refrigerant circuit (e.g. in the refrigerant line between the „low-pressure end“ service connection and the air conditioner compressor).	– Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). – Renew hose or pipe if kinked or constricted.
	♦ Air conditioner compressor defective.	– Renew air conditioner compressor.

Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure increases above specification • Low pressure quickly drops to value in graph or below • Required cooling output is not attained	Constriction or obstruction in refrigerant circuit	– Run hand over refrigerant circuit to check for differences in temperature • If difference in temperature is found at one component: – Renew hose or pipe if kinked or constricted. – In the event of clogging, clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). • If no fault is found: – Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106).
• High and low pressure normal at first • After some time, high pressure increases above specification and • low pressure drops to value in graph or below, • Required cooling output is no longer attained	Moisture in refrigerant circuit	– Check and if necessary renew reservoir (with dryer) and restrictor, then evacuate refrigerant circuit for min. 3 hours (see note) – Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106).
• High and low pressure normal at first. • After lengthy operating period, low pressure drops excessively (evaporator ices up).		

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Note

- *If a problem involving moisture in the refrigerant circuit only occurs after a lengthy operating period or only infrequently (low pressure drops below specification and evaporator ices up), it is sufficient to renew the dryer (adjust the quantity of refrigerant oil). Subsequently, evacuate refrigerant circuit for at least 3 hours.*
- *It is not initially necessary to clean the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106) when this problem occurs. Normally, there is only a small quantity of moisture in the system which can be removed by lengthy evacuation.*

Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure normal • Low pressure too low (see graph) • Required cooling output is attained	The air conditioner compressor is defective.	– Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). – Renew air conditioner compressor.

Note

- *Observe the following regarding fault „High pressure normal, low pressure too low“: This fault may cause the evaporator to ice up or the low-pressure switch -F73- to shut off the air conditioner compressor although the amount of refrigerant in the circuit is OK.*
- *On the Audi 100, Audi A6 (up to and including Model Year 1997) and the Audi V8, this fault may result in the air conditioner compressor being shut off by the operating and display unit (if the temperature at the fresh-air blower drops below -3 °C) ⇒ Heating, air conditioning; Rep. gr. 87 .*

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure normal or too high • Low pressure too high (see graph) • air conditioner compressor noise (particularly after switch-on), • Required cooling output is not attained	Too much refrigerant in the circuit.	– Extract refrigerant from refrigerant circuit. • If quantity of refrigerant extracted roughly corresponds to specified capacity: – Renew the air conditioning system compressor. • The quantity of refrigerant extracted is substantially greater than the specified capacity. – Re-charge refrigerant circuit. – Repeat test.

Possible deviation from specification	Possible causes of fault	Fault elimination
• High and low pressure normal • Required cooling output is not attained	Too much refrigerant oil in the circuit.	– Discharge refrigerant circuit. – Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106).
• High and low pressure normal • The air conditioner compressor is noisy (especially immediately after being switched on), • Required cooling output is attained		

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Note

- *Overfilling with refrigerant oil may occur if, for example, the air conditioner compressor has been renewed without adjusting the quantity of refrigerant oil.*
- *If there is too much refrigerant oil in the circuit, drain the air conditioner compressor and renew the reservoir. After cleaning the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106), add the correct amount of refrigerant oil to the circuit ⇒ page 288 .*

8.3 Checking pressures on vehicles with an expansion valve and receiver (with in-

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ternally regulated air conditioner compressor)

Note

- *Connect air conditioner service station ⇒ page 179 .*
- *Observe test requirements ⇒ page 188 .*

– Check the pressures in the refrigerant circuit (with the air conditioner service station) with the ignition switched off ⇒ page 194 .

The pressures with the ignition switched off correspond to the specifications.

– Start engine.

– Set engine speed to 2000 rpm.

– Observe the pressure reading (e.g. pressure gauge) of the air conditioner service station.

Note

- *Switching pressures and design of refrigerant circuit switches are vehicle-specific.*
- *The pressures must be measured at the service connections; the fitting locations of these connections are vehicle-specific ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*

- Specifications for pressures in refrigerant circuit ⇒ page 204

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8.3.1 Specifications for pressures in refrigerant circuit

High-pressure side:

Increasing from initial pressure (on connecting pressure gauges) up to max. 20 bar

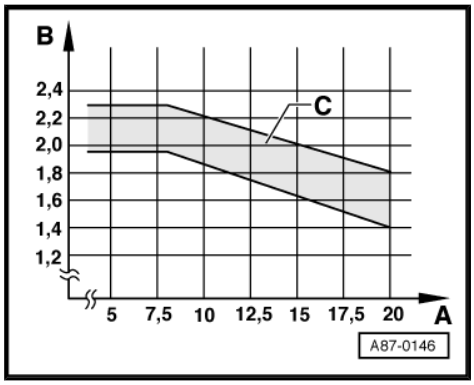
Low-pressure side:

Decreasing from initial pressure (on connecting pressure gauges) to value in graph

A - High pressure in bar

B - Low pressure in bar

C - Permissible tolerance range



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Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure remains constant or only increases slightly (above pressure with engine stopped) • Low pressure quickly drops to value in graph or below • Required cooling output is not attained	Not enough refrigerant in circuit or expansion valve defective	– Extract refrigerant from refrigerant circuit. • If quantity of refrigerant extracted roughly corresponds to specified capacity: – Renew expansion valve. – Re-charge refrigerant circuit. – Repeat test.
• High pressure normal • Low pressure in line with value in graph • Required cooling output is not attained		• The quantity of refrigerant extracted is substantially less than the specified capacity. – Localise leak with leak detector and eliminate – Re-charge refrigerant circuit. – Repeat test.

Note

If no fault can be found and air conditioner operation is not OK when the test is repeated, clean the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106).

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure does not increase or only to slightly above the pressure with the engine stopped, • low pressure does not decrease or only slightly. • Required cooling output is not attained	♦ No actuation of the air conditioner compressor (magnetic clutch) ♦ The air conditioner compressor is not driven.	– Check actuation and drive of the air conditioner compressor and perform repair ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87

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Possible deviation from specification	Possible causes of fault	Fault elimination
	♦ Constriction or blockage in the refrigerant circuit (e.g. in the refrigerant line between the „low-pressure end“ service connection and the air conditioner compressor).	– Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). – Renew hose or pipe if kinked or constricted.
	♦ The air conditioner compressor is defective.	– Renew air conditioner compressor.

Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure increases above specification • Low pressure quickly drops to value in graph or below • Required cooling output is not attained	♦ Constriction or obstruction in refrigerant circuit ♦ Expansion valve defective	– Run hand over refrigerant circuit to check for differences in temperature • If difference in temperature is found at one component: – Renew hose or pipe if kinked or constricted. – In the event of clogging, clean the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106 and renew the expansion valve if applicable). • If no fault is found: – Clean the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106 and renew the expansion valve if applicable). – Repeat test.

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Note

If operation is not OK after cleaning the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106), the expansion valve must be renewed.

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High and low pressure normal at first, • After some time, high pressure increases above specification and low pressure drops to value in graph or below • Required cooling output is no longer attained	♦ Expansion valve defective ♦ Moisture in refrigerant circuit	– Renew receiver (with dryer) and evacuate refrigerant circuit for at least 3 hours (see notes) – Check expansion valve for dirt or corrosion and renew if necessary – Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106).
• High and low pressure normal at first • After lengthy operating period, low pressure drops excessively (evaporator ices up)		

Note

♦ *It is not initially necessary to clean the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106) when this problem occurs. Normally, there is only a small quantity of moisture in the system which can be removed by lengthy evacuation.*

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♦ *If a problem involving moisture in the refrigerant circuit only occurs after a lengthy operating period or only infrequently (low pressure drops below specification and evaporator ices up), it is sufficient to renew the dryer (adjust the quantity of refrigerant oil). Subsequently, evacuate refrigerant circuit for at least 3 hours.*

Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure normal or too high • Low pressure too high (see graph) • Required cooling output is not attained • The air conditioner compressor is noisy (especially immediately after being switched on).	♦ Too much refrigerant in the circuit. ♦ Expansion valve or air conditioner compressor defective.	– Extract refrigerant from refrigerant circuit. • If quantity of refrigerant extracted roughly corresponds to specified capacity: – Renew expansion valve. – Re-charge refrigerant circuit. – Repeat test. • The quantity of refrigerant extracted is significantly greater than the prescribed charge quantity. – Re-charge refrigerant circuit. – Repeat test.

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Note

If operation of the air conditioning system is not OK when the test is repeated, re-fit the old expansion valve and clean the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). Then renew the air conditioner compressor and receiver.

Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure only increases slightly above pressure with engine stopped • Low pressure only drops slightly • Required cooling output is not attained	The air conditioner compressor is defective.	– Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). – Renew the air conditioner compressor and receiver.

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure normal • Low pressure too low (see graph) • Required cooling output is attained	Expansion valve or air conditioner compressor defective.	– Renew expansion valve. – Re-charge refrigerant circuit. – Repeat test.

Note

- *If operation of the air conditioning system is not OK when the test is repeated, re-fit the old expansion valve and clean the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). Then renew the air conditioner compressor and receiver.*
- *In this case, the evaporator may ice up although the correct quantity of refrigerant is present in the refrigerant circuit.*

Possible deviation from specification	Possible causes of fault	Fault elimination
• High and low pressure normal • Required cooling output is not attained	Too much refrigerant oil in the circuit.	– Discharge refrigerant circuit. – Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106).

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High and low pressure normal • The air conditioner compressor is noisy (especially immediately after being switched on), • Required cooling output is attained		

Note

- *Overfilling with refrigerant oil may occur if, for example, the air conditioner compressor has been renewed without adjusting the quantity of refrigerant oil.*
- *If there is too much refrigerant oil in the circuit, drain the air conditioner compressor and renew the receiver. After cleaning the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106), add the correct amount of refrigerant oil to the circuit ⇒ page 288 .*

8.4 Checking pressures on vehicles with restrictor, reservoir and air conditioner compressor regulating valve -N280- (with externally regulated air conditioner compressor)

Note

- *Connect air conditioner service station ⇒ page 179 .*
- *Observe test requirements ⇒ page 188 .*

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– Check the pressures in the refrigerant circuit (with the air conditioner service station) with the ignition switched off ⇒ page 194 .

The pressures with the ignition switched off correspond to the specifications.

– Start engine.
– Set engine speed to 2000 rpm.
– Observe the pressure reading (e.g. pressure gauge) of the air conditioner service station.

Note

- *The switching pressures for actuation of -N280- and the radiator fans -V7- are vehicle-specific.*
- *The pressures must be measured at the service connections; the fitting locations of these connections are vehicle-specific ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*

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♦ Specifications for pressures in refrigerant circuit ⇒ page 210

8.4.1 Specifications for pressures in refrigerant circuit

High-pressure side:

Increasing from initial pressure (on connection of pressure gauges) up to 20 bar

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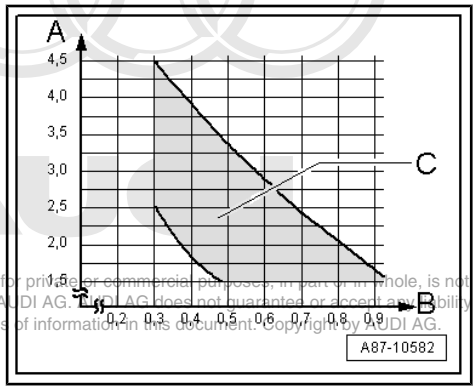
Low-pressure side:

Decreasing from initial pressure (on connecting pressure gauges) to value in graph

A - Low pressure (measured at service connection) in bar absolute

B - Control current for air conditioner compressor regulating valve -N280- in amps

C - Permissible tolerance range



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Note

- *In the event of a very high cooling output requirement (e.g. high ambient temperature and high fresh-air blower speed at low engine speed), the air conditioner compressor cannot initially set the pressure on the low-pressure end to the value -C- given in the graph (e.g. for a certain time after switching on the air conditioner). The air conditioner compressor is actuated with the maximum specified control current, however the delivery volume of the air conditioner compressor is no longer sufficient under these ambient conditions and at this engine speed to reduce the pressure on the low-pressure end to the value in the graph. One way of checking the control action of the air conditioner compressor under these conditions is to actuate the fresh-air blower with only approx. 40 % of the maximum voltage and to check the pressures at reduced fresh-air blower speed ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *Under unfavourable conditions (very high ambient temperatures, high humidity), pressure in high-pressure side may increase to max. 29 bar.*
- *The control current -B- is displayed in the measured value block of the operating and display unit for Climatronic air conditioning system -E87- or the operating and display unit, Climatronic control unit -J255-.*
- *The pressure in the refrigerant circuit measured by the high-pressure sender -G65- or the refrigerant pressure and temperature sender -G395- is displayed in the measured value block of the operating and display unit for Climatronic air conditioning system -E87- or the operating and display unit, Climatronic control unit -J255- ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *The low pressure settles as a function of the control current for the air conditioner compressor regulating valve -N280- within the air conditioner compressor output range in the tolerance band.*
- *Under unfavourable conditions (very high ambient temperatures, high humidity), the air conditioner compressor output may not always be sufficient to attain the specified value.*
- *If the compressor capacity utilisation is greater than 90 %, the pressure on the low-pressure end may be in excess of the tolerance range „C“ shown in the graph (the compressor output no longer suffices).*
- *The specified operating current for the regulating valve must be greater than 0.3 A to ensure reliable actuation of the regulating valve.*
- *„0 bar absolute pressure“ corresponds to an absolute vacuum. Normal ambient pressure corresponds to 1 bar absolute. On the scales of most pressure gauges, 0 bar corresponds to an absolute pressure of one bar (can be seen from „-1 bar“ mark below „0“).*
- *In the "maximum cooling output" setting, the control current is regulated to approx. 0.65 (vehicle-specific up to 0.85 A) (displayed in measured value block) ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure remains constant or only increases slightly (above pressure with engine stopped) • Low pressure quickly drops to value in graph or below • Required cooling output is not attained	♦ Actuation of air conditioner compressor regulating valve -N280- not OK ♦ Not enough refrigerant in circuit	– Check actuation of -N280- . – Localise leak with leak detector and eliminate – Re-charge refrigerant circuit.
• High pressure normal • Low pressure too low (see graph) • Required cooling output is not attained		
• High pressure normal • Low pressure too low (see graph) • Required cooling output is not attained		

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Note

If no fault is found for this problem, clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106).

Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure does not increase or only to slightly above the pressure with the engine stopped, • low pressure does not decrease or only slightly. • Required cooling output is not attained	♦ No actuation of the air conditioner compressor (air conditioner compressor regulating valve -N280-) ♦ The air conditioner compressor is not driven.	– Check actuation and drive of the air conditioner compressor and perform repair ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87
	♦ Constriction or blockage in the refrigerant circuit (e.g. in the refrigerant pipe between the „low-pressure end“ service connection and the air conditioner compressor). ♦ The air conditioner compressor is defective.	– Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). – Renew hose or pipe if kinked or constricted. – Renew air conditioner compressor.

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure increases above specification • Low pressure quickly drops to value in graph or below • Required cooling output is not attained	♦ Actuation of air conditioner compressor regulating valve -N280- not OK ♦ Constriction or obstruction in refrigerant circuit	– Check actuation of -N280- . – Run hand over refrigerant circuit to check for differences in temperature • If difference in temperature is found at one component: – Renew hose or pipe if kinked or constricted. – Flush the refrigerant circuit with compressed air and nitrogen if clogged. • If no fault is found: – Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106).

Possible deviation from specification	Possible causes of fault	Fault elimination
• High and low pressure normal at first, after some time high pressure increases above specification and • Low pressure drops to value in graph or below • Required cooling output is no longer attained	♦ Actuation of air conditioner compressor regulating valve -N280- not OK ♦ Moisture in refrigerant circuit	– Check actuation of -N280- . – Renew reservoir (with dryer) and evacuate refrigerant circuit for at least 3 hours (see note) – Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106).
• High and low pressure normal at first • After lengthy operating period, low pressure drops excessively (evaporator ices up)		

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Note

- *It is not initially necessary to clean the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106) when this problem occurs. Normally, there is only a small quantity of moisture in the system which can be removed by lengthy evacuation.*
- *If a problem involving moisture in the refrigerant circuit only occurs after a lengthy operating period or only infrequently (low pressure drops below specification and evaporator ices up), it is sufficient to renew the dryer (adjust the quantity of refrigerant oil). Subsequently, evacuate refrigerant circuit for at least 3 hours.*
- *A problem with evaporator output temperature sender -G263- can also cause icing-up of refrigerant circuit. If this problem is encountered, also pay attention to the measured value of the evaporator output temperature sender -G263- ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure normal • Low pressure too low (see graph) • Required cooling output is attained	♦ Actuation of air conditioner compressor regulating valve -N280- not OK ♦ The air conditioner compressor is defective.	– Check actuation of -N280- . – Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). – Renew air conditioner compressor.

Note

Observe the following with regard to fault „High pressure normal, low pressure too low“: This fault may cause evaporator to ice up although quantity of refrigerant in circuit is OK. Check measured values of evaporator output temperature sender -G263- and actuation of air conditioner compressor regulating valve -N280- . If the measured value of the evaporator output temperature sender -G263- is incorrect, the evaporator may ice up or the cooling output is not attained ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure normal or too high • Low pressure too high (see graph) • The air conditioner compressor is noisy (especially immediately after being switched on), • Required cooling output is not attained	♦ Actuation of air conditioner compressor regulating valve -N280- not OK ♦ Too much refrigerant in the circuit.	– Check actuation of -N280- . – Extract refrigerant from refrigerant circuit. • If quantity of refrigerant extracted roughly corresponds to specified capacity: – Renew the air conditioning system compressor. • The quantity of refrigerant extracted is significantly greater than the prescribed charge quantity. – Re-charge refrigerant circuit. – Repeat test.
• High and low pressure normal • Required cooling output is not attained	♦ Actuation of air conditioner compressor regulating valve -N280- not OK ♦ Too much refrigerant oil in the circuit.	– Check actuation of -N280- . – Discharge refrigerant circuit.
• High pressure and low pressure are normal. • Air conditioner compressor noise (particularly after switch-on). • The required refrigeration capacity is attained.		– Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106).

Note

- *Overfilling with refrigerant oil may occur if, for example, the air conditioner compressor has been renewed without adjusting the quantity of refrigerant oil.*
- *If there is too much refrigerant oil in the circuit, drain the air conditioner compressor and renew the reservoir. After cleaning the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106), add the correct amount of refrigerant oil to the circuit ⇒ page 288 .*

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8.5 Checking pressures on vehicles with expansion valve, receiver and air conditioner compressor regulating valve -N280- (with externally regulated air conditioner compressor)

Note

- *Connect air conditioner service station ⇒ page 179 .*
- *Observe test requirements ⇒ page 188 .*
- *If problems are only encountered at one evaporator on vehicles fitted with two evaporators, check whether the pressures in the refrigerant circuit are OK. Check for cross-sectional restriction or blockage of the line connection between the problematic evaporator and the outgoing line connection at the refrigerant line distribution point. If no fault is found, discharge the refrigerant circuit and re-fill it with the specified quantity of refrigerant. Then check the pressures and the cooling output of the air conditioner again. If the problem persists, renew the expansion valve upstream of the problematic evaporator ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*

– Check the pressures in the refrigerant circuit (with the air conditioner service station) with the ignition switched off ⇒ page 194 .

The pressures with the ignition switched off correspond to the specifications.

– Start engine.
– Set engine speed to 2000 rpm.
– Observe the pressure reading (e.g. pressure gauge) of the air conditioner service station.

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Note

- *The switching pressures for actuation of the air conditioner compressor regulating valve -N280- and the radiator fans -V7- are vehicle-specific.*
- *The pressures must be measured at the service connections; the fitting locations of these connections are vehicle-specific ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*

- Specifications for pressures in refrigerant circuit ⇒ page 217

8.5.1 Specifications for pressures in refrigerant circuit

High-pressure side:

Increasing from initial pressure (on connecting pressure gauges) up to max. 20 bar

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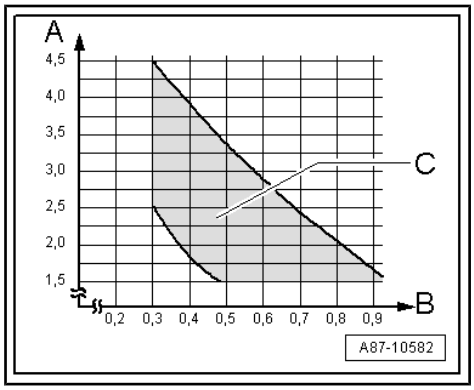
Low pressure:

Decreasing from initial pressure (on connecting pressure gauges) to value in graph

A - Low pressure (measured at service connection) in bar absolute

B - Control current for air conditioner compressor regulating valve -N280- in amps

C - Permissible tolerance range (applicable to compressor capacity utilisation of 10...90 %).



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Note

- *In the event of a very high cooling output requirement (e.g. high ambient temperature and high fresh-air blower speed at low engine speed), the air conditioner compressor cannot initially set the pressure on the low-pressure end to the value -C- given in the graph (e.g. for a certain time after switching on the air conditioner). The air conditioner compressor is actuated with the maximum specified control current, however the delivery volume of the air conditioner compressor is no longer sufficient under these ambient conditions and at this engine speed to reduce the pressure on the low-pressure end to the value in the graph. One way of checking the control action of the air conditioner compressor under these conditions is to actuate the fresh-air blower with only approx. 40 % of the maximum voltage and to check the pressures at reduced fresh-air blower speed ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *Under unfavourable conditions (very high ambient temperatures, high humidity), the pressure on the high-pressure end may increase up to max. 29 bar.*
- *The control current -B- is displayed in the measured value block of the operating and display unit for Climatronic air conditioning system -E87- or the Climatronic control unit -J255- .*
- *The high pressure measured by the high-pressure sender -G65- or the refrigerant pressure and temperature sender -G395- is displayed in the measured value block of the operating and display unit for Climatronic air conditioning system -E87- or the operating and display unit, Climatronic control unit -J255- .*
- *The low pressure settles as a function of the control current for the air conditioner compressor regulating valve -N280- and the control characteristic of the expansion valve within the air conditioner compressor output range in the tolerance band.*
- *Under unfavourable conditions (very high ambient temperatures, high humidity), the air conditioner compressor output may not always be sufficient to attain the specified value.*
- *If the compressor capacity utilisation is greater than 90 %, the pressure on the low-pressure end may be in excess of the tolerance range „C“ shown in the graph (the compressor output no longer suffices).*
- *The specified operating current for the air conditioner compressor regulating valve -N280- must be greater than 0.3 A to ensure reliable valve actuation.*
- *In the „maximum cooling output“ setting, the control current for the air conditioner compressor regulating valve -N280- is regulated to approx. 0.65 A (up to 0.85 A). This measured value is vehicle-specific and displayed in the measured value block.*
- *On the absolute pressure scale, 0 bar corresponds to an absolute vacuum. Normal ambient pressure corresponds to 1 bar absolute. On the scales of most pressure gauges, 0 bar corresponds to an absolute pressure of 1 bar (can be seen from -1 bar mark below 0) ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure remains constant or only increases slightly (above pressure with engine stopped) • Low pressure quickly drops to value in graph or below • Required cooling output is not attained	♦ Actuation of air conditioner compressor regulating valve -N280- not OK ♦ Not enough refrigerant in circuit ♦ Expansion valve defective	– Check actuation of -N280- – Extract refrigerant from refrigerant circuit. • If quantity of refrigerant extracted is substantially less than specified capacity:
• High pressure normal • Low pressure in line with value in graph • Required cooling output is not attained		– Localise leak with leak detector and eliminate – Re-charge refrigerant circuit. – Repeat test.
• High pressure normal • Low pressure too low (see graph) • Required cooling output is not attained		• If quantity of refrigerant extracted roughly corresponds to specified capacity: – Renew expansion valve. – Re-charge refrigerant circuit. – Repeat test.

Note

- *If no fault is found for this problem, clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106).*
- *Check the measured values of the evaporator output temperature sender -G263- and actuation of -N280- . If the measured value of the evaporator output temperature sender -G263- is not OK, the evaporator may ice up or the cooling output is not attained.*
- *If, after renewing the expansion valve, operation of the air conditioning system is not OK when the test is repeated (re-fit old expansion valve), clean the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). Then renew the air conditioner compressor and receiver.*
- *In this case, the evaporator may ice up although the correct quantity of refrigerant is present in the refrigerant circuit.*
- *If the expansion valve is defective (permanently closed or does not open sufficiently), -N280- is actuated to maximum output and the low pressure drops to the value in the graph or below (the air conditioner compressor draws off refrigerant from the low-pressure end). As however refrigerant cannot flow via the expansion valve, the cooling output is not attained and the high pressure may also not increase or only increase slightly due to the absence of energy conversion ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure does not increase or only to slightly above the pressure with the engine stopped, • low pressure does not decrease or only slightly. • Required cooling output is not attained	♦ No actuation of the air conditioner compressor (air conditioner compressor regulating valve -N280-) ♦ The air conditioner compressor is not driven.	– Check actuation and drive of the air conditioner compressor and perform repair ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87
	♦ Constriction or blockage in the refrigerant circuit (e.g. in the refrigerant pipe between the „low-pressure end“ service connection and the air conditioner compressor).	– Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). – Renew hose or pipe if kinked or constricted.
	♦ The air conditioner compressor is defective.	– Renew air conditioner compressor.

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Note

♦ *In the event of this problem, make sure the air conditioner compressor (air conditioner compressor shaft) is actually being driven via the pulley/drive unit ⇒ Heating, air conditioning; Rep. gr. 87 / ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*

♦ *As of Model Year 2012, air conditioner compressors with both -N280- and an air conditioning system magnetic clutch -N25- fitted at the pulley are to be introduced for certain engines and models. In the event of this problem, make sure -N25- is actually being actuated and that the air conditioner compressor (air conditioner compressor shaft) is being driven via the pulley ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure increases above specification • Low pressure quickly drops to value in graph • Required cooling output is not attained	♦ Actuation of air conditioner compressor regulating valve -N280- not OK ♦ Constriction or obstruction in refrigerant circuit ♦ Expansion valve defective	– Check actuation of -N280- . – Run hand over refrigerant circuit to check for differences in temperature • If difference in temperature is found at one component: – Renew hose or pipe if kinked or constricted. – In the event of clogging, clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). – Re-charge refrigerant circuit. – Repeat test. • If no fault is found: – Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). – Re-charge refrigerant circuit. – If function is not OK, repeat test: – Renew expansion valve and receiver.

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Note

- *If the function of the air conditioning system is not OK when the test is repeated, renew expansion valve and receiver.*
- *With this fault, the evaporator may ice up although the quantity of refrigerant in the circuit is OK.*
- *If the expansion valve is defective (permanently closed or does not open sufficiently), the air conditioner compressor regulating valve -N280- is actuated to maximum output and the low pressure drops to the value in the graph or below (the air conditioner compressor draws off refrigerant from the low-pressure end). As however refrigerant cannot flow via the expansion valve, the cooling output is not attained and the high pressure may also not increase or only increase slightly due to the absence of energy conversion ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *If there is too much refrigerant oil in the circuit, drain the air conditioner compressor and renew the receiver. After cleaning the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106), add the correct amount of refrigerant oil to the circuit ⇒ page 288 .*

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High and low pressure normal at first • After some time, high pressure increases above specification and • Low pressure drops to value in graph or below • Required cooling output is no longer attained	♦ Actuation of air conditioner compressor regulating valve -N280- not OK ♦ Moisture in refrigerant circuit	– Check actuation of -N280- . – Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106).
• High and low pressure normal at first, • After lengthy driving time, low pressure drops below specification (evaporator ices up)		– Renew receiver with dryer. – Evacuate refrigerant circuit for at least 3 hours. – Re-charge refrigerant circuit. – Repeat test.

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Note

- *It is not initially necessary to clean the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106) when this problem occurs. Normally, there is only a small quantity of moisture in the system which can be removed by lengthy evacuation.*
- *If a problem involving moisture in the refrigerant circuit only occurs after a lengthy operating period or only infrequently (low pressure drops below specification and evaporator ices up), it is sufficient to renew the dryer in the receiver (adjust quantity of refrigerant oil). Subsequently, evacuate refrigerant circuit for at least 3 hours.*
- *In this case, the evaporator may ice up although the correct quantity of refrigerant is present in the refrigerant circuit.*
- *A problem with evaporator output temperature sender -G263- can also cause icing-up of refrigerant circuit. If this problem is encountered, also pay attention to the measured value of the evaporator output temperature sender -G263- ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure normal • Low pressure too low (see graph) • Required cooling output is attained	♦ Actuation of air conditioner compressor regulating valve -N280- not OK ♦ Expansion valve or air conditioner compressor defective. ♦ The air conditioner compressor is defective.	– Check actuation of -N280- . – Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106) (not always necessary, refer to notes). – Renew expansion valve and receiver. – Re-charge refrigerant circuit. – If function is not OK, repeat test: – Renew air conditioner compressor . – Re-charge refrigerant circuit. – Repeat test.

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Note

- *Observe the following regarding fault „High pressure normal, low pressure too low“: This fault may cause the evaporator to ice up although the amount of refrigerant in the circuit is OK.*
- *If the problem is with -N280- (the regulating valve is not actuated but the air conditioner compressor operates nevertheless), the refrigerant circuit does not have to be cleaned (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). It is sufficient in this case to renew the air conditioner compressor (heed quantity of refrigerant oil in air conditioner compressor).*
- *If the expansion valve is defective (permanently closed or does not open sufficiently), -N280- is actuated to maximum output and the low pressure drops to the value in the graph or below (the air conditioner compressor draws off refrigerant from the low-pressure end). As refrigerant cannot however flow via the expansion valve, the cooling output is not attained and the high pressure may either not increase or only slightly due to the absence of energy conversion.*
- *Check the measured values of the evaporator output temperature sender -G263- and actuation of -N280- . If the measured value of the evaporator output temperature sender -G263- is incorrect, the evaporator may ice up or the cooling output is not attained ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure normal or too high • Low pressure too high (see graph) • The air conditioner compressor is noisy (especially immediately after being switched on), • Required cooling output is attained	♦ Actuation of air conditioner compressor regulating valve -N280- not OK ♦ Too much refrigerant in the circuit. ♦ Expansion valve defective ♦ The air conditioner compressor is defective.	– Check actuation of -N280- . – Extract refrigerant from refrigerant circuit. • The quantity of refrigerant extracted roughly corresponds to the actual capacity. – Renew expansion valve and receiver. – Re-charge refrigerant circuit. – If function is not OK, repeat test: – Renew the air conditioning system compressor. • If quantity of refrigerant extracted is substantially greater than specified capacity: – Re-charge refrigerant circuit. – Repeat test.

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Note

♦ *This fault may also be caused by too much refrigerant oil in the circuit. Overfilling with refrigerant oil may occur if, for example, the air conditioner compressor has been renewed without adjusting the quantity of refrigerant oil.*

♦ *If the expansion valve is defective (permanently closed or does not open sufficiently), -N280- is actuated to maximum output and the low pressure drops to the value in the graph or below (the air conditioner compressor draws off refrigerant from the low-pressure end). As however refrigerant cannot flow via the expansion valve, the cooling output is not attained and the high pressure may also not increase or only increase slightly due to the absence of energy conversion ⇒ Vehicle diagnostic tester („self-diagnosis“ or „Guided Fault Finding“ function for air conditioner) and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*

Possible deviation from specification	Possible causes of fault	Fault elimination
• High and low pressure normal • Required cooling output is attained	♦ Actuation of air conditioner compressor regulating valve -N280- not OK ♦ Too much refrigerant in the circuit. ♦ Expansion valve defective	– Check actuation of -N280- . – Discharge refrigerant circuit. – Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106).

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High and low pressure normal • The air conditioner compressor is noisy (especially immediately after being switched on), • Required cooling output is attained		– Add the correct quantity of refrigerant oil to the circuit (refer to note). – Re-charge refrigerant circuit. – If function is not OK, repeat test: – Renew expansion valve. – Re-charge refrigerant circuit. – Repeat test.

Note

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- *Overfilling with refrigerant oil may occur if, for example, the air conditioner compressor has been renewed without adjusting the quantity of refrigerant oil.*
- *If the expansion valve is defective (permanently open), the evaporator temperature is no longer regulated such that only refrigerant in gas form exits from the evaporator. Under certain usage conditions, liquid droplets may then be drawn in by the air conditioner compressor and cause noise (liquid cannot be compressed).*
- *If there is too much refrigerant oil in the circuit, drain the air conditioner compressor and renew the receiver. After cleaning the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106), add the correct amount of refrigerant oil to the circuit ⇒ page 288 .*

8.6 Checking pressures on vehicles with an electrically driven air conditioner compressor (vehicles with a high-voltage system)

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

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WARNING

Working on vehicles with high-voltage wiring:

- *Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.*
- *High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.*
- *The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.*

DANGER!

Risk of fatal injury if high-voltage components are damaged.

Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

If work is necessary in the vicinity of high-voltage system components, perform a visual inspection of the high-voltage components and wiring to check for damage ⇒ page 6 and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

If work is necessary on high-voltage system components, de-energise the high-voltage system ⇒ Electrical system; Rep. gr. 93 ; De-energising high-voltage system and note ⇒ Electrical system;

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Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

Note

The work on the refrigerant circuit using the air conditioner service station (here: checking pressure) described in the following can only be carried out when the vehicle's drive system is active; if necessary, re-energise the high-voltage system.

Re-energising high-voltage system

DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- ***Voltage levels in the high-voltage system constitute a safety hazard.***
- ***For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.***
- ***The high-voltage system may only be re-energised by a suitably qualified person (Audi high-voltage technician).***
- ***The system may only be re-energised using the vehicle diagnostic tester via „Guided Fault Finding".***
- ***The vehicle is then made ready for operation again by the qualified person (Audi high-voltage technician).***
- ***The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.***

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Note

- *Re-energise high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - Re-energise high-voltage system (Rep. gr. 93)`

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DANGER!

When working on a vehicle with the ignition switched on or while the drive system is active, the engine can start unexpectedly and exhaust fumes can cause a health hazard in closed rooms. Moving parts can trap or draw in parts of the body and/or clothing (safety hazard).

Before switching on the ignition, perform the following steps:

- *Move selector lever to position P*
- *Activate parking brake*
- *Switch off ignition*
- *Open bonnet*
- *Connect battery charger (e.g. -VAS 5095A-) to jump-start connections of 12 V electrical system*
- *Switch on ignition*

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– To minimise the number of automatic engine starts when the vehicle's drive system is active during test and measurement work, charge the vehicle batteries e.g. with the battery charger 60A -VAS 5904- in battery standby mode ⇒ Electrical system; Rep. gr. 27 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

– For test and measurement work that requires the vehicle's drive system to be active or the ignition to be switched on, move the selector lever to position „P“, activate the parking brake and arrange the tools needed so that they cannot come into contact with moving components of the engine and so that they cannot even come near to components that turn when the engine is running.

Note

- *Move the selector lever to position „P“ and activate the parking brake before performing test and measurement work for which the ignition must be switched on but where the vehicle's drive system does not need to be active.*
- *The status of the drive system is shown by the control unit in dash panel insert -J285- via the „power meter“ ⇒ Owner's Manual .*
- *Activating and deactivating drive system ⇒ Owner's Manual (note display of control unit in dash panel insert -J285-).*

– Switch off ignition.

- Connect air conditioner service station ⇒ page 179 .
- Observe test requirements ⇒ page 188 .

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Note

If problems are only encountered at one evaporator on vehicles fitted with two evaporators (one in air conditioning unit and one in battery cooling module), check whether the pressures in the refrigerant circuit are OK. Check for cross-sectional restriction or blockage of the pipe connection between the problematic evaporator and the outgoing pipe connection at the refrigerant pipe distribution point. If no fault is found, discharge the refrigerant circuit and re-fill it with the specified quantity of refrigerant. Then check the pressures and the cooling output of the air conditioner again. If the problem persists, check/renew the following components: If the problem only occurs at the evaporator in the air conditioning unit, check the refrigerant shut-off valve 1 for hybrid battery -N516- (the valve is open when it is not actuated and allows refrigerant to flow through). Renew the expansion valve at the evaporator in the air conditioning unit if no fault is found at -N516- . If the problem only occurs at the evaporator in the battery cooling module, check the actuation of the refrigerant shut-off valve 2 for hybrid battery -N517- at the expansion valve on the evaporator in the battery cooling module (the valve is closed when it is not actuated and does not allow refrigerant to flow through) ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific Workshop Manual).

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– Check the pressures in the refrigerant circuit (with the air conditioner service station) with the ignition switched off ⇒ page 194 .

The pressures with the ignition switched off correspond to the specifications.

– To minimise the number of automatic engine starts when the vehicle's drive system is active during test and measurement work, charge the vehicle batteries e.g. with the battery charger 60A -VAS 5904- in battery standby mode ⇒ Electrical system; Rep. gr. 27 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

Note

- *Move the selector lever to position „P“ and activate the parking brake before performing test and measurement work for which the ignition must be switched on but where the vehicle's drive system does not need to be active.*
- *On vehicles with a high-voltage system, the engine does not have to be running to check the pressures in the refrigerant circuit.*
- *The status of the drive system is shown by the control unit in dash panel insert -J285- via the „power meter“ ⇒ Owner's Manual .*
- *Activate READY (and heed the display in the control unit in dash panel insert -J285-) ⇒ Owner's manual .*

– READY activation ⇒ Owner's manual

– Switch on the air conditioner.

– Observe the pressure reading (e.g. pressure gauge) of the air conditioner service station.

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Note

- *The electrically driven air conditioner compressor is actuated by the vehicle electronics. The engine speed has no influence on the cooling output of the air conditioner.*
- *When the vehicle is stationary or only moving slowly (up to a vehicle speed of approx. 45 km /h), the air conditioner compressor is not actuated at the maximum specified speed (of approx. 8500 rpm) (the air conditioner compressor speed is limited to approx. 5000 rpm).*
- *Actuation of the electrically driven air conditioner compressor can be monitored by way of the Guided Fault Finding routine ⇒ Vehicle diagnostic tester, „Guided Fault Finding" function for air conditioner and battery regulation*
- *The pressures must be measured at the service connections; the fitting locations of these connections are vehicle-specific ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*

- Specifications for pressures in refrigerant circuit ⇒ page 231

8.6.1 Specifications for pressures in refrigerant circuit

High-pressure side:

Increasing from initial pressure (on connecting pressure gauges) up to max. 20 bar

Low-pressure side:

Dropping from initial pressure (on connecting pressure gauges) to a value between 1.5 and 2.3 bar absolute (depending on cooling output required).

Air conditioner compressor speed:

Between 800 and 8600 rpm depending on cooling output required (currently max. 5000 rpm with vehicle stationary)

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Note

- *The temperature of the air downstream of the evaporator, the current air conditioner compressor speed and the refrigerant pressure on the high-pressure end are displayed as measured values by the operating and display unit, Climatronic control unit -J255- ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner*
- *In the event of a very high cooling output requirement (e.g. high ambient temperature and high fresh-air blower speed), the air conditioner compressor cannot initially set the pressure on the low-pressure end to the necessary value (e.g. for a certain time after switching on the air conditioner). When the vehicle is stationary or only moving slowly (up to a vehicle speed of approx. 45 km /h), the air conditioner compressor is not actuated at the maximum specified speed (of approx. 8500 rpm) (the air conditioner compressor speed is limited to approx. 5000 rpm). Limitation of the maximum permissible air conditioner compressor speed is only cancelled as of a vehicle speed of more then approx. 45 km/h. At an air conditioner compressor speed of 5000 rpm, with a high ambient temperature and a high fresh air blower speed (unfavourable ambient conditions), the output (delivery volume) of the air conditioner compressor is not sufficient at first to reduce the pressure on the low-pressure end to the specified value. One way of checking the control action of the air conditioner compressor under these conditions is to actuate the fresh-air blower with only approx. 40 % of the maximum voltage and to check the pressures at reduced fresh-air blower speed ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner and battery regulation and ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *Under unfavourable conditions (very high ambient temperatures, high humidity), the pressure on the high-pressure end may increase up to max. 29 bar.*
- *The specified speed of the air conditioner compressor is displayed as measured value by the operating and display unit, Climatronic control unit -J255- ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner .*
- *The high pressure measured by the refrigerant pressure and temperature sender -G395- is displayed as measured value by the operating and display unit, Climatronic control unit -J255- ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner .*
- *Depending on the speed of the air conditioner compressor and the control characteristic of the expansion valve, the low pressure settles in the tolerance band within the air conditioner compressor output range (1.5 to 2.3 bar).*
- *The specified speed of the air conditioner compressor must be greater than 1500 rpm for this test.*
- *In the „maximum cooling output“ setting, the specified speed is regulated to approx. 4000 to 5000 rpm. This value is vehicle-specific and is displayed as measured value by the operating and display unit, Climatronic control unit -J255- ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner and battery regulation .*
- *On the absolute pressure scale, 0 bar corresponds to an absolute vacuum. Normal ambient pressure corresponds to 1 bar absolute. On the scales of most pressure gauges, 0 bar corresponds to an absolute pressure of 1 bar (can be seen from -1 bar mark below 0) ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner and ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *If on a vehicle with two evaporators (one each in air conditioning unit and battery cooling module), the measured temperature corresponds to or is below the specified value at one evaporator but the required specified value is not attained at the other evaporator, the system is controlled as follows: The*

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure remains constant or only increases slightly (above pressure with engine stopped) • low pressure quickly drops to specified value or below. • the required cooling output is not attained in the evaporator in the air conditioning unit (and in the evaporator in the battery cooling module).	♦ Actuation of air conditioner compressor not OK ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner, air conditioner compressor and battery regulation . ♦ Not enough refrigerant in circuit ♦ Expansion valve for evaporator in air conditioning unit defective. ♦ Refrigerant shut-off valve 1 for hybrid battery -N516- defective (blocked)	– Check actuation and operation of the air conditioner compressor – Extract refrigerant from refrigerant circuit. • If quantity of refrigerant extracted is substantially less than specified capacity: – Localise leak with leak detector and eliminate – Re-charge refrigerant circuit. – Repeat test.
• High pressure normal • low pressure corresponds to specified value, • Required cooling output is not attained		• If quantity of refrigerant extracted roughly corresponds to specified capacity: – Check operation of refrigerant shut-off valve 1 for hybrid battery -N516- – Renew expansion valve. – Re-charge refrigerant circuit. – Repeat test.

Note

Observe notes *⇒ page 235* .

Possible deviation from specification	Possible causes of fault	Fault elimination
On vehicles without refrigerant shut-off valve 1 for hybrid battery -N516- • High pressure normal • low pressure too low (below specified value) • Required cooling output is not attained at evaporator in air conditioning unit.	♦ Actuation of air conditioner compressor not OK ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner, air conditioner compressor and battery regulation . ♦ Not enough refrigerant in circuit ♦ Expansion valve for evaporator in air conditioning unit defective.	– Extract refrigerant from refrigerant circuit. • If quantity of refrigerant extracted is substantially less than specified capacity: – Localise leak with leak detector and eliminate – Re-charge refrigerant circuit. – Repeat test. • If quantity of refrigerant extracted roughly corresponds to specified capacity: – Renew expansion valve. – Re-charge refrigerant circuit. – Repeat test.

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Possible deviation from specification	Possible causes of fault	Fault elimination
On vehicles with -N516- • High pressure normal • low pressure too low (below specified value) • The required cooling output is not attained at the evaporator in the air conditioning unit and at the evaporator in the battery cooling module.	♦ Actuation of air conditioner compressor not OK ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner, air conditioner compressor and battery regulation . ♦ Not enough refrigerant in circuit ♦ Expansion valve for evaporator in air conditioning unit defective. ♦ -N516- defective (blocked)	– Extract refrigerant from refrigerant circuit. • If quantity of refrigerant extracted is substantially less than specified capacity (continue as described for vehicles without -N516-) • If quantity of refrigerant extracted roughly corresponds to specified capacity: – Check actuation and operation of -N516- and -N517- – Renew expansion valve. – Re-charge refrigerant circuit. – Repeat test.

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Note

- *If no fault is found for this problem, clean the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). Constriction or blockage in the refrigerant circuit may also lead to one of these problems*
- *Check the measured values of the evaporator output temperature sender -G263- and, if fitted, of the temperature sensor upstream of evaporator for hybrid battery -G756- and of the temperature sensor downstream of evaporator for hybrid battery -G757- as well as actuation of the air conditioner compressor by way of the control unit for air conditioning compressor -J842- by the battery regulation control unit -J840- ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner and battery regulation .*
- *An incorrect -G263- , -G756- or -G757- measured value may also cause problems with the cooling output or the evaporator may ice up.*
- *If, after renewing the expansion valve for example, operation of the air conditioner is not OK when the test is repeated (refit old expansion valve), clean the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). Then renew the air conditioner compressor and receiver/dryer cartridge.*
- *In the event of a fault at a temperature sensor, the evaporator may ice up although the quantity of refrigerant in the circuit is OK.*
- *If the expansion valve at the evaporator in the air conditioning unit or -N516- is defective (is permanently closed or does not open sufficiently), the air conditioner compressor is actuated to maximum output and the low pressure drops to the value in the graph or below (air conditioner compressor draws off refrigerant from low-pressure side). As however refrigerant cannot flow via the expansion valve, the cooling output is not attained and the high pressure may also not increase or only increase slightly due to the absence of energy conversion ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner and battery regulation and ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *The output of the evaporator in the air conditioning unit is considerably higher than that of the evaporator in the battery cooling module. Depending on the version, the refrigerant shut-off valve 2 for hybrid battery -N517- at the expansion valve in the battery cooling module is currently only actuated by the battery regulation control unit -J840- in order to cool the drive battery -A2- (hybrid battery) only when the battery reaches a certain temperature; energy conversion via the evaporator in the battery cooling module is not increased or only slightly increased ⇒ Vehicle diagnostic tester in „Guided Fault Finding“ mode for air conditioner and battery regulation and ⇒ Air conditioning; Rep. gr. 87 .*

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Possible deviation from specification	Possible causes of fault	Fault elimination
On vehicles with -N516- • High pressure normal • low pressure too low (below specified value) • The required cooling output is not attained solely at the evaporator in the air conditioning unit (the cooling output is OK at the evaporator in the battery cooling module).	♦ Actuation of air conditioner compressor not OK ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner, air conditioner compressor and battery regulation . ♦ Not enough refrigerant in circuit ♦ Expansion valve for evaporator in air conditioning unit defective. ♦ Refrigerant shut-off valve 1 for hybrid battery -N516- defective (blocked)	– Extract refrigerant from refrigerant circuit. • If the quantity of refrigerant extracted is substantially less than the specified capacity: – Localise leak with leak detector and eliminate – Re-charge refrigerant circuit. – Repeat test. • If quantity of refrigerant extracted roughly corresponds to specified capacity: – Check actuation and operation of -N516- . Renew expansion valve at evaporator in air conditioning unit if no fault is found. – Re-charge refrigerant circuit. – Repeat test.
• High pressure normal • low pressure too low (below specified value) • The required cooling output is not attained solely at the evaporator in the battery cooling module (the cooling output is OK at the evaporator in the air conditioning unit).	♦ Actuation or operation of refrigerant shut-off valve 2 for hybrid battery -N517- , of a control motor, blower or temperature sensor in or at battery cooling module not OK. ♦ Constriction or blockage in the refrigerant line to or from the expansion valve at the battery cooling module ♦ Expansion valve for evaporator in battery cooling module defective. ♦ Not enough refrigerant in circuit	– Check operation and actuation of the battery cooling module components ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner, air conditioner compressor and battery regulation – Check refrigerant lines – Extract refrigerant from refrigerant circuit. – Renew expansion valve with -N517- – Re-charge refrigerant circuit. – Repeat test.

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Note

- *The refrigerant shut-off valve 2 for hybrid battery -N517- is currently only actuated by the battery regulation control unit -J840- in order to cool the drive battery -A2- (hybrid battery) when the battery reaches a certain temperature. If air conditioning mode has not already been activated at this point, the electrical air conditioner compressor -V470- is actuated via the control unit for air conditioning compressor -J842- by -J840- . The temperature of the air upstream and downstream of the evaporator in the battery cooling module is determined by -J840- . If it is established that the cooling action is not sufficient, this is stored in -J840- ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner, air conditioner compressor and battery regulation*
- *The temperature of the air (and thus the cooling output of the evaporator) in the battery cooling module is determined by way of built-in temperature sensors (at present it cannot be measured with a thermometer during operation) and can only be checked using the Guided Fault Finding routine ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner, air conditioner compressor and battery regulation .*
- *For further information, refer to ⇒ page 235*

Possible deviation from specification	Possible causes of fault	Fault elimination
On vehicles with refrigerant shut-off valve 1 for hybrid battery -N516- • High pressure does not increase or only to slightly above the pressure with the engine stopped, • low pressure does not decrease or only slightly. • the required cooling output is not attained in the evaporator in the air conditioning unit (and in the evaporator in the battery cooling module).	♦ No actuation of air conditioner compressor, air conditioner compressor is not driven. ♦ -N516- defective (blocked)	– Check actuation and operation of the air conditioner compressor and repair if necessary ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner and battery regulation – Check actuation and operation of -N516- . Renew expansion valve at evaporator in air conditioning unit if no fault is found.

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Possible deviation from specification	Possible causes of fault	Fault elimination
	♦ Constriction or blockage in the refrigerant circuit (e.g. in the refrigerant pipe between the „low-pressure end“ service connection and the air conditioner compressor).	– Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). – Renew hose or pipe if kinked or constricted.
	♦ The air conditioner compressor is defective.	– Renew air conditioner compressor.

Possible deviation from specification	Possible causes of fault	Fault elimination
On vehicles without refrigerant shut-off valve 1 for hybrid battery -N516- • High pressure increases above specification • low pressure quickly drops to specified value, • the required cooling output is not attained in the evaporator in the air conditioning unit (and in the evaporator in the battery cooling module).	♦ Actuation or operation of air conditioner compressor not OK. ♦ Constriction or obstruction in refrigerant circuit ♦ Expansion valve defective	– Check actuation and operation of the air conditioner compressor and repair if necessary ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner and battery regulation – Run hand over refrigerant circuit to check for differences in temperature • If difference in temperature is found at one component: – Renew hose or pipe if kinked or constricted. – In the event of clogging, clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). – Re-charge refrigerant circuit. – Repeat test. • If operation is not OK and no fault is found: – Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). – Re-charge refrigerant circuit. – If function is not OK, repeat test: – Renew expansion valve and receiver.

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Possible deviation from specification	Possible causes of fault	Fault elimination
On vehicles with -N516- • High pressure increases above specification • low pressure quickly drops to specified value, • the required cooling output is not attained in the evaporator in the air conditioning unit (and in the evaporator in the battery cooling module).	♦ Actuation or operation of air conditioner compressor or -N516- not OK ♦ Constriction or obstruction in refrigerant circuit ♦ Expansion valve defective	– Check actuation of air conditioner compressor and -N516- ⇒ Vehicle diagnostic tester in „Guided Fault Finding“ mode for air conditioner and battery regulation . – Further testing as described for vehicles without -N516-

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Note

- *If the operation of the air conditioner is not OK when the test is repeated, renew the expansion valve and receiver (and -N516- if fitted).*
- *In this case, the evaporator may ice up although the correct quantity of refrigerant is present in the refrigerant circuit.*
- *If the expansion valve at the evaporator in the air conditioning unit or -N516- is defective (is permanently closed or does not open sufficiently), the air conditioner compressor is actuated to maximum output and the low pressure drops to the specified value or below (air conditioner compressor draws off refrigerant from low-pressure side). However, as refrigerant cannot flow via expansion valve -N516- , cooling output is not attained and high pressure may also not increase or only increase slightly since there is no energy conversion ⇒ Vehicle diagnostic tester in „Guided Fault Finding“ mode for air conditioner and battery regulation and ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific Workshop Manual).*
- *If the expansion valve at the evaporator in the battery cooling module is defective (or refrigerant shut-off valve 2 for hybrid battery -N517- is not operating or is not actuated properly), or if the expansion valve is permanently closed or does not open sufficiently, the air conditioner compressor is also actuated to maximum output (the required temperatures in the battery cooling module are not reached). The pressure on the low-pressure side then only drops to or below the specified value if no cooling output is requested in the air conditioning unit at the same time (-N516- is actuated and closed). The air conditioner compressor draws off the refrigerant from the low-pressure end of both evaporators). However, as no refrigerant can flow via the expansion valve in the air conditioning unit (-N516-) and the cooling output is not reached in the battery cooling module (fault in area of battery cooling module), the electric air conditioner compressor is actuated at a higher speed. As however no more refrigerant can flow, the pressure on the low-pressure end drops below the specified value and the high pressure may also not increase or only increase slightly due to the absence of energy conversion ⇒ Vehicle diagnostic tester, „Guided Fault Finding“ function for air conditioner and battery regulation and ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *As the output of the evaporator in the battery cooling module is considerably less than that of the evaporator in the air conditioning unit, the specified temperature required may still be attained in the battery cooling module with insufficient refrigerant in the circuit, however the specified temperature will no longer be attained in the evaporator in the air conditioning unit (although the air conditioner compressor is being actuated at a higher speed).*
- *If there is too much refrigeration oil in the circuit, also drain (flush) the air conditioner compressor and renew the receiver/dryer cartridge. After cleaning the refrigerant circuit (flushing with refrigerant R134a ⇒ page 115 or blowing out with compressed air and nitrogen ⇒ page 106), add the correct amount of refrigeration oil to the circuit (to the air conditioner compressor) ⇒ page 288 .*

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High and low pressure normal at first • After some time, high pressure increases above specification and • low pressure drops to specified value or below, • the required cooling output is not attained in the evaporator in the air conditioning unit (and in the evaporator in the battery cooling module).	♦ Actuation or operation of air conditioner compressor or -N516- not OK ♦ Moisture in refrigerant circuit	– Check actuation of air conditioner compressor and -N516- ⇒ Vehicle diagnostic tester in „Guided Fault Finding“ mode for air conditioner and battery regulation . – Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106).
• High and low pressure normal at first, • After lengthy driving time, low pressure drops below specification (evaporator ices up)		– Renew receiver with dryer. – Evacuate refrigerant circuit for at least 3 hours. – Re-charge refrigerant circuit. – Repeat test.

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Note

- *It is not initially necessary to clean the refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106) when this problem occurs. Normally, there is only a small quantity of moisture in the system which can be removed by lengthy evacuation.*
- *If a problem involving moisture in the refrigerant circuit only occurs after a lengthy operating period or only infrequently (low pressure drops below specification and evaporator ices up), it is sufficient to renew the dryer in the receiver (adjust quantity of refrigeration oil). Subsequently, evacuate refrigerant circuit for at least 3 hours.*
- *With this fault, the evaporator may ice up although the quantity of refrigerant in the circuit is OK.*
- *A fault at the evaporator output temperature sender -G263- or / and if fitted at the temperature sensor downstream of evaporator for hybrid battery -G757- may also cause the refrigerant circuit to ice up. If this problem occurs, also heed the measured value for -G263- and -G757- (on vehicles with a battery cooling module) ⇒ Vehicle diagnostic tester; Function „Guided Fault Finding“ for air conditioner and ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure normal • Low pressure too low • the required cooling output is not attained in the evaporator in the air conditioning unit (and in the evaporator in the battery cooling module).	♦ Actuation or operation of air conditioner compressor or -N516- / -N517- (if installed) not OK ♦ Expansion valve in air conditioning unit or, if fitted, in battery cooling module defective. ♦ The air conditioner compressor is defective.	– Check actuation and operation of air conditioner compressor and -N516- / -N517- (if installed) ⇒ Vehicle diagnostic tester in „Guided Fault Finding“ mode for air conditioner and battery regulation . – Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106) (not always necessary, refer to notes). – Renew the expansion valve for the evaporator in the air conditioning unit (and for the evaporator in the battery cooling module) as well as the receiver / dryer. – Re-charge refrigerant circuit. – If function is not OK, repeat test: – Renew air conditioner compressor. – Re-charge refrigerant circuit. – Repeat test.

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Note

- *Observe the following regarding fault „High pressure normal, low pressure too low“: This fault may cause the evaporator to ice up although the amount of refrigerant in the circuit is OK.*
- *If the problem is with the air conditioner compressor (the air conditioner compressor is actuated at excessively high speed by the air conditioner compressor regulating valve -J842-), the refrigerant circuit does not have to be cleaned (flushed with refrigerant R134a ⇒ page 115 or blown out with compressed air and nitrogen ⇒ page 106). It is sufficient in this case to renew the air conditioner compressor (heed quantity of refrigerant oil in air conditioner compressor).*
- *If the expansion valve (or one of the two expansion valves) is defective (permanently closed or does not open sufficiently), the air conditioner compressor is also actuated to maximum output and the pressure on the low-pressure end drops to the value in the graph or below (the air conditioner compressor draws off refrigerant from the low-pressure end). As refrigerant cannot however flow via the defective expansion valve, the cooling output is not attained in the downstream evaporator and the high pressure may either not increase or only increase slightly due to the absence of energy conversion. The air conditioner compressor may however be actuated at higher speed, as the required cooling output is not being attained in one evaporator. The same also applies if operation or actuation of the shut-off valve 1 for refrigerant of hybrid battery - N516- or shut-off valve 2 for refrigerant of hybrid battery - N517- is not OK ⇒ Vehicle diagnostic tester; Function „Guided Fault Finding“ for air conditioner and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *Check the measured values for the evaporator output temperature sender -G263- (and if applicable the measured values for the temperature sensor upstream of evaporator for hybrid battery -G756- and the temperature sensor downstream of evaporator for hybrid battery -G757-) as well as actuation of the air conditioner compressor by the control unit for air conditioning compressor -J842- . If the measured value of -G263- (or -G756- , -G757-) or actuation of the air conditioner compressor is not OK, the evaporator may ice up or the required cooling output is not attained ⇒ Vehicle diagnostic tester; Function „Guided Fault Finding“ for air conditioner and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High pressure normal or too high • low pressure too high, • The air conditioner compressor is noisy (especially immediately after being switched on), • the required cooling output is not attained in the evaporator in the air conditioning unit and/or in the evaporator in the battery cooling module.	♦ Actuation or operation of air conditioner compressor not OK. ♦ Too much refrigerant in the circuit. ♦ Expansion valve defective ♦ The air conditioner compressor is defective.	– Check actuation and operation of air conditioner compressor and -N516- / -N517- (if installed) ⇒ Vehicle diagnostic tester in „Guided Fault Finding“ mode for air conditioner and battery regulation . – Extract refrigerant from refrigerant circuit. • The quantity of refrigerant extracted roughly corresponds to the actual capacity. – Renew the expansion valve for the evaporator in the air conditioning unit (and for the evaporator in the battery cooling module) as well as the receiver / dryer. – Re-charge refrigerant circuit. – Repeat the test, if operation is not OK: – Renew the air conditioning system compressor. • If quantity of refrigerant extracted is substantially greater than specified capacity: – Re-charge refrigerant circuit. – Repeat test.

Note

♦ *This fault may also be caused by too much refrigerant oil in the circuit. Overfilling with refrigerant oil may occur if, for example, the air conditioner compressor has been renewed without adjusting the quantity of refrigerant oil.*

♦ *If the expansion valve for the evaporator in the air conditioning unit (or for the evaporator in the battery cooling module) is defective (permanently closed or does not open sufficiently), the air conditioner compressor is actuated to maximum output and the low pressure drops to the specified value or below (the air conditioner compressor draws off refrigerant from the low-pressure end). As refrigerant cannot however flow via the expansion valve, the cooling output is not attained and the high pressure may also either not increase or only increase slightly due to the absence of energy conversion. The same also applies if operation or actuation of the shut-off valve 1 for refrigerant of hybrid battery -N516- or shut-off valve 2 for refrigerant of hybrid battery -N517- is not OK ⇒ Vehicle diagnostic tester; Function „Guided Fault Finding“ for air conditioner and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*

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Possible deviation from specification	Possible causes of fault	Fault elimination
• High and low pressure normal • the required cooling output is not attained in the evaporator in the air conditioning unit (and in the evaporator in the battery cooling module).	♦ Actuation or operation of air conditioner compressor not OK. ♦ Actuation or operation of -N516- / -N517- not OK ♦ Too much refrigerant in the circuit. ♦ Expansion valve defective	– Check actuation and operation of air conditioner compressor and -N516- / -N517- (if installed) ⇒ Vehicle diagnostic tester in „Guided Fault Finding“ mode for air conditioner and battery regulation . – Discharge refrigerant circuit. – Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106). – Add the correct quantity of refrigerant oil to the circuit (refer to note). – Re-charge refrigerant circuit. – If function is not OK, repeat test: – Renew expansion valve. – Re-charge refrigerant circuit. – Repeat test.
• High and low pressure normal • The air conditioner compressor is noisy (especially immediately after being switched on), • the required cooling output is not attained in the evaporator in the air conditioning unit (and in the evaporator in the battery cooling module).		

Note

- ♦ *Overfilling with refrigerant oil may occur if, for example, the air conditioner compressor has been renewed without adjusting the quantity of refrigerant oil.*
- ♦ *If for example the expansion valve is defective (permanently open), the evaporator temperature (in the air conditioning unit) is no longer regulated such that only refrigerant in gas form exits from the evaporator. Under certain usage conditions, liquid droplets may then be drawn in by the air conditioner compressor and cause noise (liquid cannot be compressed).*
- ♦ *If there is too much refrigerant oil in the circuit, drain the air conditioner compressor and renew the receiver. After cleaning the refrigerant circuit (flushing with refrigerant R134a ⇒ page 115), add the correct amount of refrigeration oil to the circuit ⇒ page 288 .*

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9 Renewing components of refrigerant circuit

- Renewing components ⇒ page 246

9.1 Renewing components

Vehicles with high-voltage system (hybrid vehicles)

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

WARNING

Working on vehicles with high-voltage wiring:

- *Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.*
- *High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.*
- *The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.*

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DANGER!

Risk of fatal injury if high-voltage components are damaged.

Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

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If work is necessary in the vicinity of high-voltage system components, perform a visual inspection of the high-voltage components and wiring to check for damage ⇒ page 6 and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

If work is necessary on high-voltage system components, de-energise the high-voltage system ⇒ Electrical system; Rep. gr. 93 ; De-energising high-voltage system and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

De-energising high-voltage system

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DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be de-energised by a suitably qualified person (Audi high-voltage technician).*
- *It must be definitely confirmed that the high-voltage system is de-energised. The system may only be de-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The qualified person (Audi high-voltage technician) confirms that the system is de-energised and uses the locking cap -T40262- to ensure that the system cannot be re-energised. The ignition key and the maintenance connector for high-voltage system - TW - should then be stored in a safe place by the qualified person.*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

Note

- *De-energising high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - De-energise high-voltage system (Rep. gr. 93)`

Re-energising high-voltage system

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DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be re-energised by a suitably qualified person (Audi high-voltage technician).*
- *The system may only be re-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The vehicle is then made ready for operation again by the qualified person (Audi high-voltage technician).*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

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Note

- *Re-energise high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - Re-energise high-voltage system (Rep. gr. 93)`

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DANGER!

When working on a vehicle with the ignition switched on or while the drive system is active, the engine can start unexpectedly and exhaust fumes can cause a health hazard in closed rooms. Moving parts can trap or draw in parts of the body and/or clothing (safety hazard).

Before switching on the ignition, perform the following steps:

- *Move selector lever to position P*
- *Activate parking brake*
- *Switch off ignition*
- *Open bonnet*
- *Connect battery charger (e.g. -VAS 5095A-) to jump-start connections of 12 V electrical system*
- *Switch on ignition*

– To minimise the number of automatic engine starts when the vehicle's drive system is active during test and measurement work, charge the vehicle batteries e.g. with the battery charger 60A -VAS 5904- in battery standby mode ⇒ Electrical system; Rep. gr. 27 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

– For test and measurement work that requires the vehicle's drive system to be active or the ignition to be switched on, move the selector lever to position „P“, activate the parking brake and arrange the tools needed so that they cannot come into contact with moving components of the engine and so that they cannot even come near to components that turn when the engine is running.

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Note

- *Move the selector lever to position „P“ and activate the parking brake before performing test and measurement work for which the ignition must be switched on but where the vehicle's drive system does not need to be active.*
- *The status of the drive system is shown by the control unit in dash panel insert -J285- via the „power meter“ ⇒ Owner's Manual .*
- *Activating and deactivating drive system ⇒ Owner's Manual (note display of control unit in dash panel insert -J285-).*

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Vehicles with start/stop system

WARNING

Injury risk due to automatic engine start (vehicles with start/stop system).

- *On vehicles with an activated start/stop system (indicated by a message in the instrument cluster display), the engine may start automatically on demand.*
- *Therefore, please make sure that the start/stop system is deactivated when performing repair work on the vehicle (switch off the ignition, and switch it on again if required).*

All vehicles

- All components of the refrigerant circuit that are to submitted to quality monitoring must always be sealed (use the original sealing caps from the replacement part).
- The replacement air conditioner compressor, reservoir, receiver, evaporator and condenser are charged with nitrogen before shipment. This charge is being gradually discontinued/ the pressure of the nitrogen charge is now so low that the escape of gas is no longer preceptible on initial opening.
- On vehicles fitted with an air conditioner compressor with no magnetic clutch, the engine is only to be started following complete assembly of the refrigerant circuit (constant air conditioner compressor operation).
- When the refrigerant circuit is empty, the air conditioner compressor with air conditioner compressor regulating valve - N280- (no magnetic clutch) is switched to internal lubrication with the result that only a minimal amount of oil is pumped from the air conditioner compressor into the circuit.

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Note

- *As replacement parts are sometimes stored for lengthy periods and at different locations, it is quite possible that gas will escape from some parts and not from others on initial opening (even in the case of identical replacement part numbers). The sealing caps at the replacement part connections are therefore to be detached carefully and the nitrogen gas allowed to escape slowly.*
- *Refrigerant circuits are fitted either with a restrictor and reservoir or with an expansion valve and receiver.*
- *The dryer cartridge or components with desiccant bag (reservoir, receiver) are always to be renewed after cleaning the refrigerant circuit (flushing with refrigerant R134a ⇒ page 115 or blowing out with compressed air and nitrogen ⇒ page 106); in doing so, leave sealed as long as possible to minimise the absorption of moisture.*
- *The dryer cartridge or components with desiccant bag (reservoir, receiver) are to be renewed if required for certain repair operations or if the refrigerant circuit has been open for a lengthy period and moisture has ingressed (e.g. following an accident) ⇒ page 253 .*
- *The period of time for which a refrigerant circuit may be left open without having to renew a component with desiccant bag (reservoir, receiver) is largely governed by ambient influences. Given a high ambient temperature and a high humidity level or if the vehicle has been standing in the open for example or driven (in wet, foggy weather conditions), the period will be considerably shorter than for a vehicle which has been standing in a heated dry area. The size of the opening through which moisture may ingress into the circuit also influences the period for which a refrigerant circuit can be left open without having to renew components with desiccant bag ⇒ page 253 .*
- *Seal open connections and lines (absorption of moisture).*
- *Always renew restrictor.*

Caution

- ***Contaminated refrigerant oils must be disposed of as used oils of unknown origin ⇒ Audi-ServiceNet, HSO Environmental Protection .***

- Leaking or damaged components (except air conditioner compressor, reservoir or receiver) ⇒ page 253
- Leaking or damaged components (except air conditioner compressor, reservoir or receiver) ⇒ page 254
- Renewing air conditioner compressor without the need for refrigerant circuit cleaning ⇒ page 255 .
- Renewing air conditioner compressor on account of leakage or internal damage ⇒ page 257
- Renewing receiver or reservoir and restrictor after cleaning refrigerant circuit ⇒ page 262
- Renewing receiver or reservoir without the need for refrigerant circuit cleaning ⇒ page 263 .
- Renewing dryer cartridge/desiccant bag without the need for refrigerant circuit cleaning ⇒ page 264

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9.1.1 Leaking or damaged components (except air conditioner compressor, reservoir or receiver)

Refrigerant circuit completely empty (e.g. in the event of major leakage or a burst hose)

Note

- *In the event of only a minor leak with slow escape of refrigerant (e.g. at a small leakage point), the amount of refrigerant oil lost and the amount of moisture ingressing is not sufficient to influence operation of the air conditioner.*
- *The operations marked * are only to be implemented in the case of a major leak (e.g. following an accident).*

Electrically driven air conditioner compressor

– Remove defective component.

– Remove and flush the electrically driven air conditioner compressor ⇒ page 132

Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air or nitrogen ⇒ page 106).*

– Pour the full specified amount of oil into the air conditioner compressor or circuit.

Mechanically driven air conditioner compressor

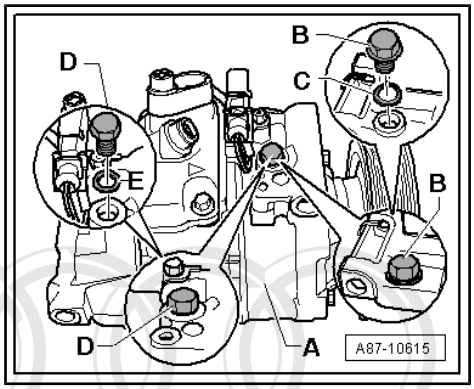
– Remove defective component.

– Remove the air conditioner compressor.*

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– Remove the oil drain plug -B- / -D- from the air conditioner compressor -A-.*



Note

- *The design of the oil drain plug -B- / -D- and the seal -C- / -E- varies (depending on the air conditioner compressor manufacturer).*
- *Pay attention to the tightening torque when fitting the oil drain plug -B- / -D- (depends on the air conditioner compressor manufacturer and the design of the oil drain plug) ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *On the „Denso“ or „Nippondenso“ air conditioner compressor, the oil drain plug -D- is fitted with a sealing ring -E- for example; always renew ⇒ Electronic parts catalogue .*
- *On the „Sanden“ or „Zexel“ air conditioner compressor, the oil drain plug -B- is fitted with an O-ring -C- for example; always renew ⇒ Electronic parts catalogue .*
- *To accelerate drainage of the refrigerant oil, crank the air conditioner compressor by way of the magnetic clutch plate for example.*
- *Pour the old refrigerant oil out of the air conditioner compressor* (disposal ⇒ Audi-ServiceNet, HSO Environmental Protection).*

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All models

Note

- *Then fill the air conditioner compressor with the quantity of fresh refrigerant oil corresponding to the quantity of refrigerant oil in the replacement compressor ⇒ page 288 .*
- *Use different refrigerant oils and quantities for the various air conditioner compressors ⇒ page 288 .*
- *To ensure air conditioner compressor lubrication on start-up, at least 80 cm^3 of refrigerant oil must be poured into the air conditioner compressor. The remainder can be added for example to the new reservoir or receiver ⇒ page 288 .*
- *If dirt has ingressed into the air conditioner compressor with the refrigerant circuit open (e.g. after an accident), the air conditioner compressor is to be renewed.*
- *Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air or nitrogen ⇒ page 106).*

– Renew dryer cartridge, receiver* or reservoir* and restrictor.

– Assemble, evacuate and re-charge refrigerant circuit.

9.1.2 Leaking or damaged components (except air conditioner compressor, reservoir or receiver)

Refrigerant circuit still contains refrigerant (e.g. minor leak)

– Discharge refrigerant circuit.

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– Remove the defective component, blow out with compressed air and collect the refrigerant oil escaping.
– The new component is to be filled with the amount of refrigerant oil blown out (plus 20 cm^3 for the evaporator, plus 10 cm^3 for the condenser, refrigerant pipes and refrigerant hoses) as fresh refrigerant oil fill.

Note

Disposal of old refrigeration oil ⇒ Audi-ServiceNet, HSO Environmental Protection .

– Renew restrictor.
– Assemble, evacuate and charge refrigerant circuit.

9.1.3 Renewing air conditioner compressor without the need for refrigerant circuit cleaning

Note

Cleaning the refrigerant circuit means flushing with refrigerant R134a ⇒ page 115 or blowing out with compressed air or nitrogen ⇒ page 106 .

For example in the case of external damage following an accident

– Discharge refrigerant circuit.
– Remove the air conditioner compressor.

Electrically driven air conditioner compressor

– Flush the defective electrically driven air conditioner compressor to remove the refrigeration oil (note down quantity of oil flushed out) ⇒ page 132 .

Note

♦ *Do not flush the replacement air conditioner compressor if 75% of the refrigeration oil (corresponding to the quantity in the replacement compressor) was flushed out of the defective air conditioner compressor.*

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♦ *If less than 60 % of the specified refrigeration oil quantity is flushed out of the defective air conditioner compressor, the remaining oil is located in the refrigerant circuit components. To prevent overfilling with refrigeration oil, flush the refrigerant circuit or the electrically driven air conditioner compressor.*

– Flush the refrigerant circuit or new electrically driven air conditioner compressor to remove the refrigeration oil ⇒ page 132 .
– Dispose of the refrigeration oil flushed out of the defective and the new air conditioner compressor / refrigerant circuit (heed ⇒ Audi-ServiceNet, HSO Environmental Protection).

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Note

The design of the electrically driven air conditioner compressor is such that it has to be flushed to remove the refrigeration oil (the refrigeration oil cannot be poured out as is the case with mechanically driven air conditioner compressors with an oil drain plug ⇒ page 132).

– Only fill the replacement air conditioner compressor with an amount of fresh refrigeration oil corresponding to the quantity of oil flushed out (of the defective air conditioner compressor).

Note

- *If, for example, 70 cm^3 of refrigeration oil has been flushed out of the defective air conditioner compressor and 140 cm^3 out of the replacement compressor (a small quantity of refrigeration oil remains in the air conditioner compressor and possibly in the air conditioner service station), fill the air conditioner compressor to be installed with 70 cm^3 of refrigeration oil (use is not to be made of the refrigeration oil flushed out of the replacement compressor as it could have become contaminated in the air conditioner service station).*
- *Use different refrigerant oils and quantities for the various air conditioner compressors ⇒ page 265 .*
- *If a greater quantity of refrigeration oil (more than approx. 80 cm^3) has been flushed out of the defective air conditioner compressor, the remaining refrigeration oil can also be added to the evaporator or reservoir/receiver ⇒ page 265 .*

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Mechanically driven air conditioner compressor

– Remove the oil drain plug from the air conditioner compressor (mechanically driven air conditioner compressor).

Note

There are different versions of the oil drain plug and the corresponding seal (an O-ring or a sealing ring may be fitted, always renew) ⇒ page 253 and ⇒ Electronic parts catalogue .

– To accelerate drainage of the refrigerant oil, crank the air conditioner compressor by way of the magnetic clutch plate for example.

– Pour the old refrigerant oil out of the air conditioner compressor (for disposal, refer to ⇒ Audi-ServiceNet, HSO Environmental Protection).

– Remove the oil drain plug from the replacement compressor, pour out the refrigerant oil and only add a quantity of fresh refrigerant oil equal to the amount poured out of the defective air conditioner compressor.

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Note

- *If, for example, 70 cm³ of refrigerant oil has been poured out of the defective air conditioner compressor and 220 cm³ out of the replacement compressor (a small quantity of refrigerant oil remains in the air conditioner compressor), fill the air conditioner compressor to be installed with 70 cm³ of refrigeration oil (use can be made of the refrigeration oil poured out of the replacement compressor).*
- *Use different refrigerant oils and quantities for the various air conditioner compressors* ⇒ page 265 .
- *If a greater quantity of refrigerant oil (more than approx. 80 cm³) has been poured out of the defective air conditioner compressor, the remaining refrigerant oil can also be added to the evaporator or reservoir/receiver* ⇒ page 265 .

All models

– Renew restrictor (only if installed in this refrigerant circuit).

– Assemble, evacuate and charge refrigerant circuit.

9.1.4 Renewing air conditioner compressor on account of leakage or internal damage

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Vehicles with high-voltage system (hybrid vehicles)

For all work on vehicles with a high-voltage system, note the additional warning instructions for working on such vehicles ⇒ „1 Warning instructions when working on vehicles with high-voltage system“, page 1 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

WARNING

Safety hazard: the engine can start unexpectedly.

Before carrying out general work on a vehicle with high-voltage electrical system, switch off the ignition and remove the ignition key from the vehicle.

WARNING

Working on vehicles with high-voltage wiring:

- *Do not support yourself or tools on high-voltage wiring or associated components --> this can damage the insulation.*
- *High-voltage wiring must not be excessively bent or kinked --> this can damage the insulation.*
- *The round high-voltage connectors are colour-coded with an external coloured ring and are provided with mechanical coding or guide lugs. It is important to observe this coding when joining up the round high-voltage connectors, otherwise the connectors can be damaged.*

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DANGER!

Risk of fatal injury if high-voltage components are damaged.

Observe the following when working in the vicinity of high-voltage components or wiring:

- *It is not permitted to use cutting or forming tools, other sharp-edged tools or heat sources such as welding, brazing, soldering, hot air or thermal bonding equipment.*
- *Before starting work, visually inspect the high-voltage components in the areas involved.*
- *Before working in the engine compartment, visually inspect the power electronics -JX1- , electric drive motor -V141- , air conditioner compressor -V470- and high-voltage wiring.*
- *Before working on the vehicle underbody, visually inspect the high-voltage wiring and covers.*
- *Before working on the rear section of the vehicle, visually inspect the high-voltage wiring and the electro-box with the maintenance connector for high-voltage system - TW - .*
- *Visually inspect all potential equalisation lines.*

Check the following when making the visual inspection:

- *There must be no external damage on any component.*
- *The insulation of the high-voltage wiring and potential equalisation lines must not be damaged.*
- *There must be no unusual deformation of the high-voltage wiring.*
- *All high-voltage components must be identified by a red warning sticker.*

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If work is necessary in the vicinity of high-voltage system components, perform a visual inspection of the high-voltage components and wiring to check for damage ⇒ page 6 and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

If work is necessary on high-voltage system components, de-energise the high-voltage system ⇒ Electrical system; Rep. gr. 93 ; De-energising high-voltage system and note ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

De-energising high-voltage system

DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be de-energised by a suitably qualified person (Audi high-voltage technician).*
- *It must be definitely confirmed that the high-voltage system is de-energised. The system may only be de-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The qualified person (Audi high-voltage technician) confirms that the system is de-energised and uses the locking cap -T40262- to ensure that the system cannot be re-energised. The ignition key and the maintenance connector for high-voltage system - TW - should then be stored in a safe place by the qualified person.*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

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Note

- *De-energising high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - De-energise high-voltage system (Rep. gr. 93)`

Re-energising high-voltage system

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DANGER!

High voltage can cause fatal injury.

Danger of severe or fatal injuries from electric shock.

- *Voltage levels in the high-voltage system constitute a safety hazard.*
- *For reasons of safety, persons with life-preserving or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.*
- *The high-voltage system may only be re-energised by a suitably qualified person (Audi high-voltage technician).*
- *The system may only be re-energised using the vehicle diagnostic tester via „Guided Fault Finding".*
- *The vehicle is then made ready for operation again by the qualified person (Audi high-voltage technician).*
- *The qualified person (Audi high-voltage technician) marks the vehicle by attaching the appropriate warning signs.*

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Note

- *Re-energise high-voltage system:*
- *Connect vehicle diagnostic tester*
- *Select* `Guided Fault Finding` *mode*
- *Using the* `Go to` *key, select the following menu items in succession*
- `Function/component selection`
- `Body`
- `Electrical system`
- `Self-diagnosis compatible systems`
- `8C - Hybrid battery management -J840`
- `8C - Hybrid battery management, functions`
- `51 - Re-energise high-voltage system (Rep. gr. 93)`

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DANGER!

When working on a vehicle with the ignition switched on or while the drive system is active, the engine can start unexpectedly and exhaust fumes can cause a health hazard in closed rooms. Moving parts can trap or draw in parts of the body and/or clothing (safety hazard).

Before switching on the ignition, perform the following steps:

- ***Move selector lever to position P***
- ***Activate parking brake***
- ***Switch off ignition***
- ***Open bonnet***
- ***Connect battery charger (e.g. -VAS 5095A-) to jump-start connections of 12 V electrical system***
- ***Switch on ignition***

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– To minimise the number of automatic engine starts when the vehicle's drive system is active during test and measurement work, charge the vehicle batteries e.g. with the battery charger 60A -VAS 5904- in battery standby mode ⇒ Electrical system; Rep. gr. 27 and ⇒ Electrical system; Rep. gr. 93 ; General warning instructions for work on the high-voltage system .

– For test and measurement work that requires the vehicle's drive system to be active or the ignition to be switched on, move the selector lever to position „P“, activate the parking brake and arrange the tools needed so that they cannot come into contact with moving components of the engine and so that they cannot even come near to components that turn when the engine is running.

Note

- *Move the selector lever to position „P“ and activate the parking brake before performing test and measurement work for which the ignition must be switched on but where the vehicle's drive system does not need to be active.*
- *The status of the drive system is shown by the control unit in dash panel insert -J285- via the „power meter“ ⇒ Owner's Manual .*
- *Activating and deactivating drive system ⇒ Owner's Manual (note display of control unit in dash panel insert -J285-).*

All vehicles

For example due to noise from the air conditioner compressor or no air conditioner compressor output

– Discharge refrigerant circuit.

– Remove the air conditioner compressor.

– Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air or nitrogen ⇒ page 106).

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Note

- *In the event of internal (air conditioner compressor) damage, check the refrigerant hoses and condenser. If, e.g. swarf has ingressed, clean the refrigerant hoses and condenser (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air or nitrogen ⇒ page 106) and renew the refrigerant hoses if necessary.*
- *On vehicles with two evaporators, the quantity of refrigerant oil in the refrigerant circuit may be greater than the quantity in the replacement compressor. On such vehicles, add the extra quantity of refrigerant oil to the refrigerant circuit as necessary ⇒ page 106 .*
- *In the event of a fault in the electronics of an electrically driven air conditioner compressor (e.g. control unit for air conditioning compressor -J842- defective), the refrigerant circuit does not have to be flushed. In this case, the air conditioner compressor is to be renewed without having to clean the refrigerant circuit ⇒ page 255*

– Renew dryer cartridge, receiver or reservoir and restrictor.
– Check expansion valve for dirt or corrosion and renew if necessary
– Assemble, evacuate and charge refrigerant circuit.

9.1.5 Renewing receiver or reservoir and restrictor after cleaning refrigerant circuit

Note

Cleaning the refrigerant circuit means flushing with refrigerant R134a ⇒ page 115 or blowing out with compressed air or nitrogen ⇒ page 106 .

For example on account of ingress of moisture (refrigerant circuit open for lengthy period) or contamination

– Discharge refrigerant circuit.
– Remove the air conditioner compressor.
– Eliminate cause of fault.
– Clean refrigerant circuit (flush with refrigerant R134a ⇒ page 115 or blow out with compressed air or nitrogen ⇒ page 106).
– Check expansion valve for dirt or corrosion and renew if necessary

Electrically driven air conditioner compressor

– Flush the old refrigeration oil out of the air conditioner compressor ⇒ page 132 .

Mechanically driven air conditioner compressor

– Remove oil drain screw from air conditioner compressor.

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Note

There are different versions of the oil drain plug and the corresponding seal (an O-ring or a sealing ring may be fitted, always renew) ⇒ page 253 and ⇒ Electronic parts catalogue .

– To accelerate drainage of the refrigerant oil, crank the air conditioner compressor by way of the magnetic clutch plate for example.
– Pour the old refrigerant oil out of the air conditioner compressor.

Note

Disposal of old refrigeration oil ⇒ Audi-ServiceNet, HSO Environmental Protection .

All air conditioner compressors

– Then add the quantity of fresh refrigerant oil to the air conditioner compressor corresponding to the quantity of refrigerant oil in the replacement compressor (or the specified quantity of refrigerant oil on vehicles with two evaporators if applicable) ⇒ page 288 .

Note

- *Use different refrigerant oils and quantities for the various air conditioner compressors ⇒ page 288 .*
- *To ensure air conditioner compressor lubrication on start-up, at least 80 cm^3 of refrigerant oil must be poured into the air conditioner compressor. The remainder can be added for example to the new reservoir or receiver ⇒ page 265 .*
- *If dirt enters the air conditioner compressor whilst the refrigerant circuit is open (e.g. after an accident), the air conditioner compressor should be renewed.*
- *On vehicles with two evaporators, the quantity of refrigerant oil in the refrigerant circuit may be greater than the quantity in the replacement compressor. On such vehicles, add the extra quantity of refrigerant oil to the refrigerant circuit as necessary ⇒ page 106 .*

– Renew receiver or reservoir and restrictor.
– Assemble, evacuate and charge refrigerant circuit.

9.1.6 Renewing receiver or reservoir without the need for refrigerant circuit cleaning

Note

Cleaning refrigerant circuit means flushing with refrigerant R134a ⇒ page 115 or blowing out with compressed air or nitrogen ⇒ page 106 .

For example in the event of accident damage; no refrigerant escaped and no ingress of moisture and dirt into the circuit

– Discharge refrigerant circuit.

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– Renew restrictor.
– Remove receiver or reservoir.
– Remove dirt from receiver or reservoir.
– Weigh receiver or reservoir removed.
– Fill the new receiver or reservoir with refrigerant oil until it attains the weight of the vessel removed.
– Install new receiver or reservoir.
– Assemble, evacuate and charge refrigerant circuit.

9.1.7 Renewing dryer cartridge/desiccant bag without the need for refrigerant circuit cleaning

Note

Cleaning the refrigerant circuit means flushing with refrigerant R134a *⇒ page 115* *or blowing out with compressed air or nitrogen* *⇒ page 106* *.*

For example in the event of a leak; refrigerant has escaped but no dirt has ingressed into the circuit

– Discharge refrigerant circuit.
– Renew the dryer cartridge ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).
– Assemble, evacuate and charge refrigerant circuit.

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10 Capacities for refrigerant R134a, refrigerant oil and approved refrigerant oils

- Capacities for refrigerant R134a ⇒ page 265
- Approved refrigerant oils and refrigerant oil capacities ⇒ page 288

10.1 Capacities for refrigerant R134a

Note

- *When charging refrigerant circuits on the high-pressure end, always fill as far as the upper tolerance limit (liquid refrigerant remains in the charging hoses).*
- *Unless otherwise stated, the capacities specified for refrigerant R134a also apply to the corresponding „S“ and „RS“ versions of this vehicle model.*
- *When charging the refrigerant circuit, the air conditioner service station must be on the same level as the vehicle in which the refrigerant circuit is to be charged (maximum difference 50 cm). Depending on the design of the air conditioner service station , an excessive difference in height could lead to differences between the quantity of refrigerant displayed and that actually poured in. The filling accuracy of the air conditioner service station may vary.*
- *For air conditioner compressor assignment („Zexel / Valeo“, „Sanden“ or „Denso / Nippondenso“), refer to the ⇒ Electronic parts catalogue and ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *Refrigerant circuits converted from R12 to R134a are to be filled with the quantity indicated in the Workshop Manual „Air conditioner with refrigerant R12“. ⇒ Air conditioner with refrigerant R12 (this Workshop Manual is only available in hard-copy form).*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*

- ⇒ „10.1.1 Capacities for Audi A1 (8X_) 2011 ►“, page 266
- ⇒ „10.1.2 Capacities for Audi A2 (8Z_) 2001 ►“, page 266
- ⇒ „10.1.3 Capacities for Audi A3 (8L_) 1997 ► and Audi TT (8N_) 1999 ►“, page 267
- ⇒ „10.1.4 Capacities for Audi A3 (8P_) 2004 ►, Audi Q3 (8U_) 2012 ►“, page 270
- ⇒ „10.1.5 Capacities for Audi TT (8J_) 2007 ►“, page 271
- ⇒ „10.1.6 Capacities for Audi 80 (8A_/8C_), Audi Coupé (8B_), Audi Cabriolet (8G_) ► 2002“, page 272
- ⇒ „10.1.7 Capacities for Audi A4 (8D_) 1995 ► “, page 273
- ⇒ „10.1.8 Capacities for Audi A4 (8E_) 2001 ►, Audi A4 Cabriolet (8H_) 2003 ►“, page 275
- ⇒ „10.1.9 Capacities for Audi A4 (8K_) 2008 ►, Audi A5 Coupé and Sportback (8T_) 2008 ►, Audi Q5 (8R_) 2008 ►, Audi A5

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Cabriolet (8F_) 2009 ►, Audi Q5 hybrid (8R_) 2011 ►“, page 276

- ⇒ „10.1.10 Capacities for Audi 100 / Audi A6 (4A_) ► 1998“, page 277
- ⇒ „10.1.11 Capacities for Audi A6 (4B_) 1998 ► and Audi allroad (4B_) ► 2005“, page 278
- ⇒ „10.1.12 Capacities for Audi A6 (4F_) 2005 ►“, page 283
- ⇒ „10.1.13 Capacities for Audi A6 (4G_) 2011 ►, Audi A7 (4G_) 2011 ►“, page 283
- ⇒ „10.1.14 Capacities for Audi V8 (4C_) ► 1994“, page 284
- ⇒ „10.1.15 Capacities for Audi A8 (4D_) 1994 ►“, page 285
- ⇒ „10.1.16 Capacities for Audi A8 (4E_) 2003 ►“, page 285
- ⇒ „10.1.17 Capacities for Audi A8 (4H_) 2010 ►“, page 286
- ⇒ „10.1.18 Capacities for Audi Q7 (4L_) 2006 ►“, page 287
- ⇒ „10.1.19 Capacities for Audi R8 (42_) 2008 ►“, page 287

10.1.1 Capacities for Audi A1 (8X_) 2011 ►

Characteristics of refrigerant circuit:

- Expansion valve
- Receiver
- „Denso“, „Sanden“ (or „Delphi“) air conditioner compressor with air conditioner compressor regulating valve -N280- ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi A1	From 08.10 onwards	500 + / - 15	• None

Note

- *Various air conditioner compressors have been fitted depending on the production period and engine (these air conditioner compressors have no magnetic clutch).*
- *At the start of production, „Denso“ type „6 SEU 14C“ or „Sanden“ type „7 PXE 16“ air conditioner compressors were fitted ⇒ Electronic parts catalogue and ⇒ Heating, air conditioning; Rep. gr. 87 .*
- *Depending on the engine, „Delphi“ type „6 CVC 140“ air conditioner compressors may also be fitted at a later date (introduction not yet finalised) ⇒ Electronic parts catalogue and ⇒ Heating, air conditioning; Rep. gr. 87 .*

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10.1.2 Capacities for Audi A2 (8Z_) 2001 ►

Characteristics of refrigerant circuit:

- Restrictor (coloured).
- Reservoir.
- „Denso“ air conditioner compressor with no magnetic clutch and with air conditioner compressor regulating valve -N280- .

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Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi A2	From 06.00 to 07.01	525 + / - 25	• Yellow-coloured restrictor • Condenser, no. 8Z0 260 401 (403) with index „B“ or „C“.
	From 07.01 onwards	500 + / - 25	• Red-coloured restrictor • Condenser, no. 8Z0 260 401 (403) with index „D“.

Note

- *Replacement restrictors with different holes are available (yellow-coloured 1.54 mm, red-coloured 1.42 mm).*
- *Depending on manufacturer, colour of red restrictor may tend more towards orange.*
- *To avoid altering the cooling output of the air conditioner, restrictors with the same hole diameter must always be used.*
- *A restrictor with a smaller hole (red-coloured) and a condenser with a smaller internal volume are installed from model year 2002 onwards. The capacity has therefore been slightly modified (condenser -70 g, smaller restrictor +50 g) ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .*

10.1.3 Capacities for Audi A3 (8L_) 1997 ► and Audi TT (8N_) 1999 ►

Characteristics of refrigerant circuit:

- Expansion valve
- Receiver
- „Sanden“ or „Zexel / Valeo“ air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue

Capacity for Audi A3 (8L_) 1997 to 2004

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi A3	From 08.96 onwards	750 + 50	• None

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Note

- *Exclusive use was made at the start of production of „Sanden“ air conditioner compressors. With effect from Model Year 1999, use has also been made of „Zexel / Valeo“ air conditioner compressors ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .*
- *If no replacement condenser with a flat tube width = 20 mm is available for an Audi A3 and a condenser with a flat tube width = 16 mm is fitted, only 650 + / - 20 g of refrigerant are to be added instead of 750 + 50 g. In addition the capacity given on the label must be altered accordingly (heed notes on Audi TT ⇒ page 269).*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*

Capacity for Audi TT (8N_) 1999 ►

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi TT	From 10.98 to 10.03 (and from 06.04 to 08.04 ⇒ page 269)	750 + 50	• Condenser with flat tube width of 20 mm ⇒ page 269
	From 10.03 onwards (except 06.04 to 08.04 ⇒ page 269)	650 + / - 20	• Condenser with flat tube width of 16 mm ⇒ page 269

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Note

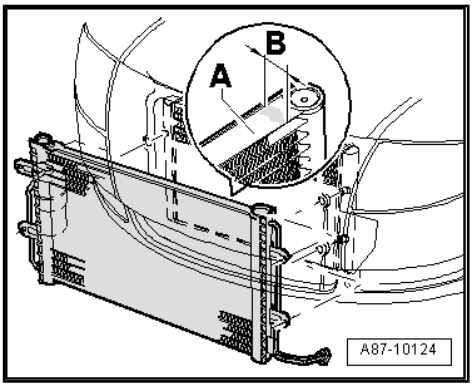
- *Exclusive use was made at the start of production of „Sanden“ air conditioner compressors. With effect from Model Year 1999, use has also been made of „Zexel / Valeo“ air conditioner compressors ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .*
- *The air conditioner compressor designation „Zexel / Valeo“ was changed as of 2006 to „Valeo“.*
- *With effect from 10.03 (as of vehicle identification number 8N41015239), production of the Audi TT was switched from the condenser with part no. „1J0 820 411 J“ (with a flat tube width of 20 mm) to the condenser with part no. „8N0 820 411 A“ (with a flat tube width of 16 mm) ⇒ page 269 . In the period between 06.04 and 08.04, a certain number of vehicles was again fitted with condensers with a flat tube width of 20 mm.*
- *Condensers with a flat tube width = 16 mm must be filled with approx. 120 g less refrigerant than condensers with a flat tube width = 20 mm ⇒ Electronic parts catalogue .*
- *In the period between 10.03 (vehicles as of vehicle identification number 8N41015239) and 06.04, the Audi TT was fitted at the factory with a condenser with a flat tube width of 16 mm (part no. „8N0 820 411 A“) and the refrigerant circuit filled with 750 + 50 grammes of refrigerant. These vehicles were also provided with a sticker showing the incorrect capacity - namely 750 grammes (or 700 grammes in 06.04) instead of 650 grammes ⇒ page 269 . Under certain ambient conditions (e.g. high ambient temperatures), over-filling of the systems may result in the air conditioner compressor being shut off on account of excess pressure in the refrigerant circuit. Complaints may also be received about engine performance (e.g. humming and drumming; the engine is subjected to greater load as the air conditioner compressor constantly has to cope with excessively high pressure). Remedy: Discharge the refrigerant circuit, then re-charge with the correct quantity and replace the label with a label indicating the correct capacity or delete the old capacity indicated on the label and enter the new capacity in waterproof ink for example.*
- *Pay attention to flat tube dimensions if condenser is renewed. If a condenser with different flat tube dimensions is to be fitted, also replace the label indicating the refrigerant R134a capacity or delete the old capacity and enter the new capacity in waterproof ink for example ⇒ Electronic parts catalogue .*

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Reading flat tube dimensions of condenser

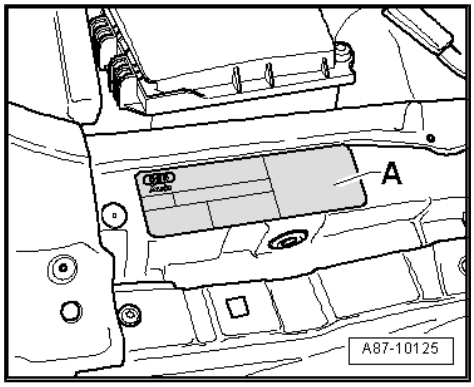
- Flat tubes of condenser -A-
- Width of flat tubes -B-

Label indicating refrigerant R134a capacity



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Pay attention to flat tube dimensions if condenser is renewed. If a condenser with different dimensions is to be fitted, also replace the label -A- indicating the refrigerant R134a capacity or delete the old capacity and enter the new capacity in waterproof ink for example ⇒ Electronic parts catalogue .



10.1.4 Capacities for Audi A3 (8P_) 2004 ►, Audi Q3 (8U_) 2012 ►

Note

The capacity for the Audi A3 also applies to the Audi A3 Sportback, the Audi RS3 (except the 5-cyl. engine) and the Audi A3 Cabriolet.

Characteristics of refrigerant circuit:

- Expansion valve
- Receiver
- „Denso“, „Delphi“, „Sanden“ or „Zexel / Valeo“ air conditioner compressor with air conditioner compressor regulating valve -N280- ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi A3 • With 4 or 6-cyl. engine	From 05.03 onwards	525 + / - 25	• None
Audi RS 3 • With 5-cyl. engine	From 01.11 onwards	500 + / - 25	• Different type of condenser fitted ⇒ Electronic parts catalogue and ⇒ Heating, air conditioning; Rep. gr. 87 .
Audi Q3	From 07.11 onwards	520 + / - 20	• None

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Note

- *Various air conditioner compressors have been fitted depending on the production period and engine (these air conditioner compressors have no magnetic clutch).*
- *At the start of production exclusive use was made of type „7 SEU 16“ air conditioner compressors from „Denso“. With effect from Model Year 2004 a gradual change was made to a different „Denso“ compressor (type „7 SEU 17“).*
- *With effect from Model Year 2004, „Zexel / Valeo“ (type „DSC17E“) and „Sanden“ (type „PXE16“) air conditioner compressors were gradually introduced depending on the engine ⇒ Electronic parts catalogue and ⇒ Heating, air conditioning; Rep. gr. 87 .*
- *With effect from Model Year 2008, „Denso“ (type „6 SEU 14“) and „Delphi“ air conditioner compressors were gradually introduced depending on the engine ⇒ Electronic parts catalogue and ⇒ Heating, air conditioning; Rep. gr. 87 .*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*

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10.1.5 Capacities for Audi TT (8J_) 2007 ►

Characteristics of refrigerant circuit:

- Expansion valve
- Receiver
- „Denso“ or „Sanden“ air conditioner compressor with air conditioner compressor regulating valve -N280- ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi TT • With 4 or 6-cyl. engine	From 08.06 onwards	525 + / - 25	• None
Audi TT • With 5-cyl. engine	From 03.09 onwards	500 + / - 25	• Different type of condenser fitted ⇒ Electronic parts catalogue and ⇒ Heating, air conditioning; Rep. gr. 87 .

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Note

- *At the start of production, exclusive use was made of air conditioner compressors of type „6 SEU 14“ manufactured by „Denso“. This air conditioner compressor has no magnetic clutch (it is constantly driven by the engine). Different makes of air conditioner compressor may also be fitted at a later date depending on the engine ⇒ Electronic parts catalogue and ⇒ Heating, air conditioning; Rep. gr. 87 .*
- *As of Model Year 2008, air conditioner compressors manufactured by „Sanden“ (type „PXE16“) were also gradually introduced for certain engines. This air conditioner compressor has no magnetic clutch (it is constantly driven by the engine) ⇒ Electronic parts catalogue and ⇒ Heating, air conditioning; Rep. gr. 87 .*

10.1.6 Capacities for Audi 80 (8A_/8C_), Audi Coupé (8B_), Audi Cabriolet (8G_) ► 2002

Characteristics of refrigerant circuit:

- Restrictor (not coloured).
- Reservoir
- „Zexel / Valeo“ air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi 80 Audi Coupé Audi Cabriolet	From 10.92 onwards	750 + 50 • Vehicles with 5-cyl. engine	• None
		650 + 50 • Vehicles with 4 or 6-cyl. engine	

Note

- *Replacement restrictors with different holes are available. If these vehicles are fitted with a yellow-coloured restrictor, add 50 g more refrigerant than specified in the table. After charging, amend capacity stated on label or affix label indicating new capacity.*
- *In order to distinguish between the two restrictor versions, the one with the smaller hole (1.54 mm) is yellow-coloured. The restrictor with the larger hole (1.83 mm) is not coloured.*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*

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Audi
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10.1.7 Capacities for Audi A4 (8D_) 1995 ►

Note

Also applies to the Audi RS 4.

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- „Denso“ or „Zexel / Valeo“ air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi A4	From 11.94 to 11.97	650 + 50	• Restrictor not coloured
	From 11.97 onwards	700 + 50	• Restrictor coloured (yellow) • „Showa“ condenser (distinguishing feature ⇒ page 274)
	From 11.98 onwards	550 + 50	• Restrictor coloured (yellow) • „AWG“ condenser (distinguishing feature ⇒ page 274)
Audi RS 4	From 05.00 onwards	650 + 50	• Restrictor coloured (yellow)

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Note

- *Restrictors with a modified hole have been installed at the factory since November 1997 (yellow-coloured). The capacity was increased by 50 g for vehicles with a yellow-coloured restrictor.*
- *In order to distinguish between the two restrictor versions, the one with the smaller hole (1.54 mm) is yellow-coloured. The restrictor with the larger hole (1.83 mm) is not coloured.*
- *The Audi A4 was fitted with different air conditioner compressors depending on the engine and production period. Exclusive use was made at the start of production of „Zexel / Valeo“ air conditioner compressors. As of Model Year 1996, „Denso“ air conditioner compressors were gradually introduced for vehicles with 6-cylinder engines.*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*
- *Replacement restrictors with different holes (not coloured, yellow-coloured, red-coloured) are available. If a vehicle is fitted with a different restrictor, add more or less refrigerant depending on type (⇒ Table). After charging, amend capacity stated on label or affix label indicating new capacity.*
- *Depending on manufacturer, colour of red restrictor may tend more towards orange.*
- *From November 1998 onwards, Audi A4 models have also been fitted with „AWG“ condensers (initially approx. 10000 vehicles with chassis numbers between 8DXA 065 253 and 8DXA 077 026). The specified capacity for vehicles with these condensers differs from those with „Showa“ condensers. The condensers can be identified on the basis of certain characteristic features ⇒ page 274 .*
- *If the condenser installed is replaced by one with a different part number, check the capacity indicated on the label in the vehicle and amend if necessary or affix a label with the correct capacity over the existing one ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .*

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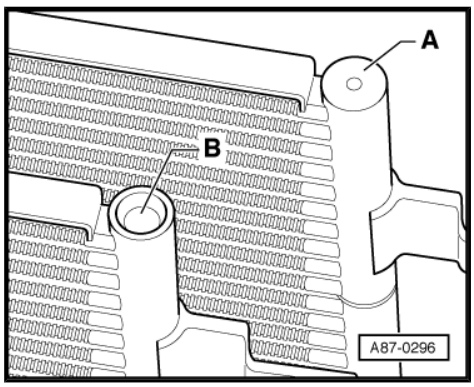
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Distinguishing features of „Showa“ and „AWG“ condensers

Different manifolds:

A - Manifold on „Showa“ condenser

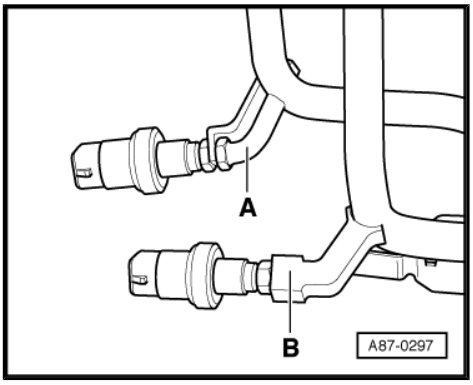
B - Manifold on „AWG“ condenser



Different connections to the pressure switch.

A - Connection area on „Showa“ condenser

B - Connection area on „AWG“ condenser



10.1.8 Capacities for Audi A4 (8E_) 2001 ►, Audi A4 Cabriolet (8H_) 2003 ►

Note

Also applies to the Audi RS 4.

Characteristics of refrigerant circuit:

- Restrictor (yellow or red-coloured).
- Reservoir
- „Denso“ air conditioner compressor with air conditioner compressor regulating valve -N280- (no magnetic clutch)

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi A4	From 11.00 onwards	500 + / - 20	• Yellow or red-coloured restrictor
Audi RS 4	From 07.05 onwards	440 + / - 20	• Red-coloured restrictor

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Note

- *Replacement restrictors with different holes are available (yellow-coloured 1.54 mm, red-coloured 1.42 mm).*
- *Depending on manufacturer, colour of red restrictor may tend more towards orange.*
- *To avoid altering the cooling output of the air conditioner, only red or yellow-coloured restrictors are to be fitted. Yellow-coloured restrictors were fitted in model year 2001. Red-coloured restrictors were introduced in model year 2002. The change to the restrictor (on vehicles produced in model year 2001, a red-coloured restrictor may also be fitted instead of a yellow-coloured one) does not alter the capacity for these vehicles.*
- *Various air conditioner compressors have been fitted depending on the production period and engine (these air conditioner compressors have no magnetic clutch).*
- *At the start of production exclusive use was made of type „6 SEU 12“ and „7 SEU 16“ air conditioner compressors from „Denso“. From model year 2004 onwards, different „Denso“ compressors (types „6 SEU 14“ and „7 SEU 17“) have gradually replaced the old ones. ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue*
- *The Audi RS 4 is fitted with a condenser with a smaller internal volume. The capacity for this vehicle is therefore lower than for the other vehicles ⇒ Electronic parts catalogue .*

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10.1.9 Capacities for Audi A4 (8K_) 2008 ►, Audi A5 Coupé and Sportback (8T_) 2008 ►, Audi Q5 (8R_) 2008 ►, Audi A5 Cabriolet (8F_) 2009 ►, Audi Q5 hybrid (8R_) 2011 ►

Note

Also applies to the Audi S5 and Audi RS 5.

Characteristics of refrigerant circuit:

- Expansion valve
- Receiver
- Refrigerant line with internal heat exchanger
- „Denso“ air conditioner compressor with air conditioner compressor regulating valve -N280- ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi A4	From 10.07 onwards	600 + / - 20	• None
Audi A5 Coupé and Sportback	From 05.07 onwards	600 + / - 20	• None

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Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi Q5	From 09.08 onwards	600 + / - 20	• None
Audi Q5 hybrid	From 05.11 onwards	840 + / - 20	• Electrically driven air conditioner compressor • With 2nd evaporator in battery cooling module
Audi A5 Cabriolet	From 03.09 onwards	600 + / - 20	• None
Audi RS 5	From 03.10 onwards	570 + / - 20	• None

Note

- *At the start of production, all vehicles except the Audi Q5 hybrid were fitted with mechanically driven air conditioner compressors manufactured by „Denso“ (e.g. type „6 SEU 14“ for vehicles with 4 and 6-cyl. engine and type „7 SEU 17“ for vehicles with 8-cyl. engine). Different makes of air conditioner compressor may also be fitted at a later date ⇒ Electronic parts catalogue and ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *The Audi RS 5 is fitted with a condenser with a smaller internal volume. The capacity for this vehicle is therefore lower than for the other vehicles of this series ⇒ Electronic parts catalogue .*

Audi
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10.1.10 Capacities for Audi 100 / Audi A6 (4A_) ► 1998

Characteristics of refrigerant circuit:

- Restrictor not coloured
- Reservoir
- „Denso“ or „Zexel / Valeo“ air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi 100 / Audi A6	From 10.92 to 03.97	750 + 50	• None

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Note

- *If a vehicle is fitted with a yellow-coloured restrictor as replacement for a non-coloured restrictor, add 50 g more refrigerant than specified in the table. In addition, the capacity specified on the label in the vehicle is to be checked and amended if necessary or the existing label is to be replaced with one indicating the correct capacity (affix over old label).*
- *Restrictors with modified hole (coloured) have been installed at the factory since November 1997. In order to distinguish between the two restrictor versions, the one with the smaller hole (1.54 mm) is yellow-coloured. The restrictor with the larger hole (1.83 mm) is not coloured.*
- *The Audi 100 / Audi A6 features different air conditioner compressors depending on the engine and production period. Exclusive use was made at the start of production of „Zexel / Valeo“ air conditioner compressors. As of Model Year 1996, „Denso“ air conditioner compressors were gradually introduced for vehicles with 6-cylinder engines.*
- *The air conditioner compressor designation „Zexel / Valeo“ was changed as of 2006 to „Valeo“.*
- *From September 1994, production was gradually switched from condenser 4A0 260 403 AB to condenser 4A0 260 403 AC.*
- *The refrigerant capacity of 750+50 g applies to all Audi 100 models (regardless of condenser).*
- *Only condensers with part number 4A0 260 403 AC are now available as replacement parts (if necessary make use of label, part no. 8A0 010 126 P).*
- *After charging the refrigerant circuit of vehicles manufactured up to October 1994, check the capacity stated on the label in the vehicle and amend if necessary or affix the label, part no. 8A0 010 126 P over the existing label (modified capacity) ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .*

10.1.11 Capacities for Audi A6 (4B_) 1998 ► and Audi allroad (4B_) ► 2005

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- „Denso“ or „Zexel Valeo“ air conditioner compressor ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

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Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi A6	From 04.97 to 11.97	800 + 50	• Restrictor not coloured • Air conditioner unit version „1“ ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual). • Condenser with flat tube dimensions 20 mm x 3 mm ⇒ page 282

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Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
	From 11.97 to 08.98	850 + 50	• Restrictor coloured (yellow) • Air conditioner unit version „1“ ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual). • Condenser with flat tube dimensions 20 mm x 3 mm ⇒ page 282

Note

- *Restrictors with a modified hole have been installed at the factory since November 1997 (yellow-coloured). The capacity was increased by 50 g for vehicles in which a yellow-coloured restrictor was installed.*
- *In order to distinguish between the two restrictor versions, the one with the smaller hole (1.54 mm) is yellow-coloured. The restrictor with the larger hole (1.83 mm) is not coloured.*
- *If a vehicle is fitted with a coloured restrictor as replacement for a non-coloured restrictor, add 50 g more refrigerant (refer to table). In addition, the capacity specified on the label in the vehicle is to be checked and amended if necessary or the existing label is to be replaced with one indicating the correct capacity (affix over old label).*
- *The Audi A6 is fitted with different air conditioner compressors depending on the engine and production period.*
- *In August/September 1998, production was gradually switched from air conditioning unit version „1“ to air conditioning unit version „2“. A reduction in capacity was achieved as the evaporator was also modified together with the air conditioner unit.*
- *The two air conditioning unit versions can be identified on the basis of certain characteristics described in the vehicle-specific workshop manual ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi A6 • With 4-cyl. engine • With 6-cyl. petrol engine	From 08.98 to 04.99	750 + 50	• Restrictor coloured (yellow) • Air conditioner unit version „2“ ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual). • Condenser with part no. 4B0 260 401 (403) and index „D“, „E“ or „F“ (flat tube dimensions 20 mm x 3 mm ⇒ page 282) ⇒ Electronic parts catalogue .

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Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi A6 • With 6-cyl. diesel engine	♦ From 08.98 to 10.98 ♦ From 12.98 to 10.99 (see notes)	750 + 50	• Restrictor coloured (yellow) • Air conditioner unit version „2“ ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual). • Condenser with part no. 4B0 260 401 (403) and index „D“, „E“ or „F“ (flat tube dimensions 20 mm x 3 mm ⇒ page 282) ⇒ Electronic parts catalogue .

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi A6/Audi allroad • With 6-cyl. diesel engine	♦ From 10.98 to 12.98 ♦ From 10.99 onwards (see notes)	550 + 50	• Restrictor coloured (yellow) • Air conditioner unit version „2 or 3“ ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual). • Condenser with part no. 4B0 260 401 (403) and index „G“ or „R“ (flat tube dimensions 16 mm x 1.7 mm ⇒ page 282) and ⇒ Electronic parts catalogue
Audi A6/Audi allroad • With 4-cyl. engine except 2.0 ltr. • With 6-cyl. petrol engine except 3.0 ltr. engine • With 6-cyl. diesel engine (see notes)	From 04.99 onwards	650 + 50	• Restrictor coloured (yellow) • Air conditioner unit version „2 or 3“ ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual). • Condenser with part no. 4B0 260 401 (403) and index „H“, „J“, „K“, „S“, „T“ or „N“ (flat tube dimensions 18 mm x 1.7 mm ⇒ page 282) and ⇒ Electronic parts catalogue .
Audi A6 • With 2.0 ltr. 4-cyl. engine • With 3.0 ltr. 6-cyl. engine	From 05.01 onwards	550 + 50	• Restrictor coloured (yellow) • Air conditioner unit version „3“ ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual). • Condenser with part no. 8E0 260 401 (403) and index A (flat tube dimensions 18 mm x 1.7 mm ⇒ page 282) and ⇒ Electronic parts catalogue . • Air conditioner compressor regulating valve -N280-

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Note

- *Condensers with air conditioning system pressure switch -F129- or high-pressure sender -G65- are supplied for factory use as part no. XXX XXX 401 X. This condenser is supplied without an air conditioning system pressure switch -F129- or high-pressure sender -G65- for replacement purposes as part no. XXX XXX 403 X.*
- *From 10.98 to 12.98 vehicles with 6-cyl. diesel engine (initially about 10000) were fitted with condensers of a different design. The capacity is different for vehicles with these condensers. The condensers can be identified on the basis of certain characteristics and the part number ⇒ page 282 .*
- *The Audi A6 is fitted with different air conditioner compressors depending on the engine and production period.*
- *On condenser replacement, pay attention to the index of the part number (different flat tube versions, flat tube dimensions 16 mm x 1.7 mm, 18 mm x 1.7 mm or 20 mm x 3 mm) and the different capacities involved. If a condenser with a different part number index is installed, the capacity specified on the label must be checked and amended if necessary or a label indicating the modified capacity must be affixed over the existing label. The part number can be found on a sticker attached to the bottom of the condenser.*
- *From 04.99 onwards, production was gradually switched from condensers with flat tube dimensions 20 mm x 3 mm to condensers with flat tube dimensions 18 mm x 1.7 mm or 16 mm x 1.7 mm. The change in production took place gradually during the course of 1999 depending on the engine and existing supplies of the different versions. Refer to the Electronic parts catalogue for precise assignment of the different condensers ⇒ Electronic parts catalogue .*
- *Vehicles as of 04.99 with 6-cyl. diesel engine may be fitted with a condenser with index „D“, „G“, „R“ or „K“. Observe the different capacities ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific Workshop Manual) and ⇒ Electronic parts catalogue .*

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi A6 • With 8-cyl. engine	• Up to 03.99 and • From 02.00 onwards	550 + 50	• Restrictor coloured (yellow) • Air conditioner unit version „2 or 3“ ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual). • Condenser with part no. 4B3 260 401 (403) B, D, E (flat tube dimensions 18 mm x 1.7 mm ⇒ page 282) ⇒ Electronic parts catalogue .
Audi A6 • With 8-cyl. engine	From 03.99 to 02.00	650 + 50	• Restrictor coloured (yellow) • Air conditioner unit version „2“ ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual). • Condenser with part no. 4B3 260 401 (403) C (flat tube dimensions 18 mm x 1.7 mm ⇒ page 282) ⇒ Electronic parts catalogue .

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Note

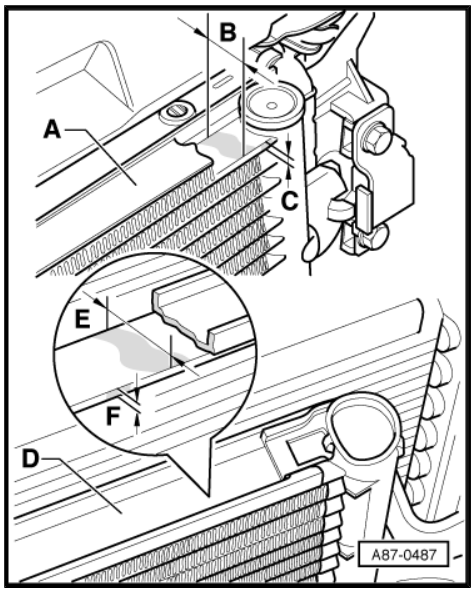
- *The Audi A6 with 8-cyl. engine is fitted with „Denso“ air conditioner compressors.*
- *In August/ September 1998 production was gradually switched from air conditioning unit version „1“ to air conditioning unit version „2“. Vehicles with an 8-cyl. engine are only fitted with air conditioning unit from version „2“ onwards.*
- *The different air conditioner unit versions can be identified on the basis of certain characteristics described in the workshop manual ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *Different condensers were installed in vehicles with 8-cylinder engines. Exclusive use was made for USA vehicles of condensers with part no. 4B3 260 401 (403) C, D, E.*
- *In March 1999, production was gradually switched from condensers with part number 4B3 260 401 (403) B to condensers with part number 4B3 260 401 (403) C.*
- *If the condenser fitted is replaced by one with a different part number, amend the capacity specified on the label or affix a label with the modified capacity over the existing label. The part number can be found on a sticker attached to the bottom of the condenser ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*

Deduct the flat tube dimensions from the condenser

Note

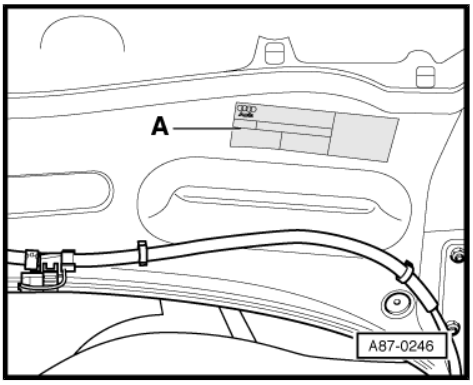
- *Production was gradually switched from calendar week 45, 1998 onwards (initially for Audi A6 with 6-cyl. diesel engine) to a condenser with smaller flat tubes.*
- *Pay attention to the part number on condenser replacement (sometimes the only distinguishing feature) ⇒ Electronic parts catalogue .*

Condensers -A- with flat tube dimensions -B- = 20 mm and -C- = 3.0 mm must be filled with more refrigerant than condensers -D- with flat tube dimensions -E- = 18 mm or 16 mm and -F- = 1.7 mm ⇒ Electronic parts catalogue .



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Pay attention to flat tube dimensions if condenser is renewed. If a condenser with different dimensions is to be fitted, also renew label -A- indicating the refrigerant R134a capacity or remove the old capacity and record the new capacity using a waterproof pen ⇒ Electronic parts catalogue .



10.1.12 Capacities for Audi A6 (4F_) 2005 ►

Note

Also applies to the Audi S6 and Audi RS 6.

Characteristics of refrigerant circuit:

- Restrictor (red-coloured).
- Reservoir
- „Denso“ air conditioner compressor with air conditioner compressor regulating valve -N280- (no magnetic clutch)

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi A6/ S6	From 04.04 onwards	530 + / - 20	• Red-coloured restrictor
Audi RS 6	From 05.08 onwards	500 + / - 20	• Red-coloured restrictor • Condenser with smaller internal volume

Note

- *Replacement restrictors with different holes are available (yellow-coloured 1.54 mm, red-coloured 1.42 mm).*
- *Depending on manufacturer, colour of red restrictor may tend more towards orange.*
- *To avoid altering the cooling output of the air conditioner, only red-coloured restrictors are to be fitted.*
- *Different air conditioner compressors are fitted depending on the model ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*
- *The condenser fitted on vehicles with a 10-cyl. TFSI engine (Audi RS 6) has a smaller internal volume than the condenser with other engines. For vehicles with a 10-cyl. TFSI engine the refrigerant capacity is thus also slightly less than for other vehicles ⇒ Electronic parts catalogue .*

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10.1.13 Capacities for Audi A6 (4G_) 2011 ►, Audi A7 (4G_) 2011 ►

Characteristics of refrigerant circuit:

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- Expansion valve
- Receiver
- Refrigerant line with internal heat exchanger
- „Denso“ air conditioner compressor with air conditioner compressor regulating valve -N280- ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi A6	From 02.11 onwards	570^{+} / - 20	• None
Audi A7	From 10.10 onwards	570^{+} / - 20	• None

Note

The air conditioner compressors fitted at the start of production are manufactured by „Denso“ (type „6 SEU 14“). Different makes of air conditioner compressor or another type of compressor may also be fitted at a later date ⇒ Electronic parts catalogue and ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).

10.1.14 Capacities for Audi V8 (4C_) ► 1994

Characteristics of refrigerant circuit:

- Restrictor (not coloured).
- Reservoir
- „Zexel / Valeo“ air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue

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Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi V8	From 10.92 to 10.93	850 + 50	• None

Note

- *Replacement restrictors with different holes are available. If these vehicles are fitted with a yellow-coloured restrictor, add 50 g more refrigerant than specified in the table. After charging, amend capacity stated on label or affix label indicating new capacity.*
- *In order to distinguish between the different restrictor versions, the ones with a smaller hole are coloured (yellow or red). The red-coloured restrictor is not to be used for these vehicles.*
- *Depending on manufacturer, colour of red restrictor may tend more towards orange.*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*

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10.1.15 Capacities for Audi A8 (4D_) 1994 ►

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- „Denso“ or „Zexel / Valeo“ air conditioner compressor ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi A8	From 05.94 to 11.97	750 + 50	• Restrictor not coloured
	From 11.97 onwards	800 + 50	• Restrictor coloured (yellow)

Note

- *Restrictors with a modified hole have been installed at the factory since November 1997 (yellow-coloured). The capacity was increased by 50 g for vehicles with a yellow-coloured restrictor.*
- *In order to distinguish between the different restrictor versions, the one with the smaller hole is coloured yellow (1.54 mm) or red (1.42 mm). The restrictor with the larger hole (1.83 mm) is not coloured.*
- *If a vehicle is fitted with a yellow-coloured restrictor as replacement for a non-coloured restrictor, add 50 g more refrigerant (see table). In addition, the capacity specified on the label in the vehicle is to be checked and amended if necessary or the existing label is to be replaced with one indicating the correct capacity (affix over old label). The red-coloured restrictor is not to be used for these vehicles.*
- *Exclusive use was made at the start of production of „Zexel / Valeo“ air conditioner compressors. As of Model Year 1996, production was gradually switched to „Denso“ air conditioner compressors ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*

10.1.16 Capacities for Audi A8 (4E_) 2003 ►

Characteristics of refrigerant circuit:

- Restrictor (red-coloured).
- Reservoir
- „Denso“ air conditioner compressor with air conditioner compressor regulating valve -N280- (no magnetic clutch)

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi A8	From 10.02 onwards	620 $^{+}$ / $_{-}$ 20	• Red-coloured restrictor

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Note

- *Replacement restrictors with different holes are available (yellow-coloured 1.54 mm, red-coloured 1.42 mm).*
- *Depending on manufacturer, colour of red restrictor may tend more towards orange.*
- *To avoid altering the cooling output of the air conditioner, only red-coloured restrictors are to be fitted.*
- *Different air conditioner compressors are fitted depending on the model ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*

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10.1.17 Capacities for Audi A8 (4H_) 2010 ►

Characteristics of refrigerant circuit:

- Expansion valve
- With one or two evaporator(s) depending on equipment
- Refrigerant line with internal heat exchanger
- Dryer cartridge in receiver at condenser
- „Denso“ air conditioner compressor with air conditioner compressor regulating valve -N280- ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

Caution

Different refrigerant and refrigeration oil capacity for vehicles with an 8-cyl. TDI engine

- ***On account of the installation position of the air conditioner compressor (at the top of the engine), the quantity of refrigeration oil differs on vehicles with an 8-cyl. TDI engine from that on the rating plate of the air conditioner compressor***

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi A8 (all except 8-cyl. TDI engine)	From 03.10 onwards		
♦ Vehicle with one evaporator		780 $^{+}$ / $_{-}$ 20	• One evaporator
♦ Vehicle with two evaporators		930 $^{+}$ / $_{-}$ 20	• Two evaporators
Audi A8 (only 8-cyl. TDI engine)	From 03.10 onwards		
♦ Vehicle with one evaporator		740 $^{+}$ / $_{-}$ 15	• One evaporator

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Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
♦ Vehicle with two evaporators		915 + / - 15	• Two evaporators

Note

On vehicles with an 8-cyl. TDI engine, the quantity of refrigeration oil in the refrigerant circuit was increased as of vehicle identification number 4H_ BN 018846 and the refrigerant capacity had to be accordingly reduced slightly. As the capacity specification on the label has not yet been changed, proceed as follows: On vehicles manufactured up to the vehicle identification number mentioned, check whether the refrigerant oil has already been topped up during a previous workshop visit. If not, add 50 ccm of refrigerant oil to the refrigerant circuit. Then correspondingly alter the refrigerant capacity specified on the label in waterproof ink and fill the refrigerant circuit with the quantity of refrigerant stated above. Finally make a record of the change made in the vehicle data. On vehicles manufactured as of the vehicle identification number mentioned, check the refrigerant capacity specified on the label, alter accordingly in waterproof ink if applicable and then fill the refrigerant circuit with the quantity of refrigerant specified above.

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10.1.18 Capacities for Audi Q7 (4L_) 2006 ►

Characteristics of refrigerant circuit:

- Expansion valve
- With one or two evaporator(s) depending on equipment
- Dryer cartridge in receiver at condenser
- „Denso“ air conditioner compressor with air conditioner compressor regulating valve -N280- ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi Q7	From 02.06 onwards		
♦ Vehicle with one evaporator		700 + 50	• One evaporator
♦ Vehicle with two evaporators		1050 + 50	• Two evaporators

10.1.19 Capacities for Audi R8 (42_) 2008 ►

Characteristics of refrigerant circuit:

- Restrictor (red-coloured).

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- Reservoir
- Two series-connected condensers
- „Denso“ air conditioner compressor with air conditioner compressor regulating valve -N280- ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

Vehicle model	Production period	Capacity in grammes	Differing characteristics of this refrigerant circuit
Audi R8	From 03.07 onwards	650 + / - 20	• Red-coloured restrictor

Note

- *Replacement restrictors with different holes are available (yellow-coloured 1.54 mm, red-coloured 1.42 mm).*
- *Depending on manufacturer, colour of red restrictor may tend more towards orange.*
- *To avoid altering the cooling output of the air conditioner, only red-coloured restrictors are to be fitted.*

10.2 Approved refrigerant oils and refrigerant oil capacities

Note

- *As PAG (polyalkylene glycol) oil is highly hygroscopic (attracts water), opened containers are to be immediately re-sealed so as to be air-tight.*
- *PAG oil from containers which have been open for a lengthy period is no longer usable.*

- Approved refrigerant oils ⇒ page 289
- Refrigerant oil capacities ⇒ page 290

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10.2.1 Approved refrigerant oils

Note

- *The oils used with refrigerant R12 are not suitable for refrigerant R134a.*
- *The name of the compressor manufacturer „Nippondenso“ has been changed to „Denso“.*
- *The refrigerant oil developed specially and exclusively for R134a refrigerant circuits is not commercially available.*
- *Refrigerant oils specifically designed for each air conditioner compressor can therefore be obtained from the replacement parts range ⇒ Electronic parts catalogue .*
- *The use of other refrigerant oils may lead to system failure, as miscibility and thus also circulation with the refrigerant R134a (for air conditioner compressor lubrication) cannot always be guaranteed.*
- *There are different refrigerant oils for „Zexel / Valeo“, „Denso“, „Delphi“ and „Sanden“ compressors. ⇒ Electronic parts catalogue*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*
- *The refrigerant oil (G 052 300 A2) for use in refrigerant circuits with „Denso“ air conditioner compressors (old name „Nippondenso“) is also included in the retrofit kit (part number 4A0 298 107 A) ⇒ Electronic parts catalogue .*
- *Use is to be made for refrigerant circuits with „Zexel / Valeo“ or „Sanden“ compressor of refrigerant oil with part no. G 052 154 A2 ⇒ Electronic parts catalogue .*
- *Use can be made for refrigerant circuits with a „Delphi“ compressor of refrigerant oil with part no. G 052 154 A2 and refrigerant oil with part no. G 052 300 A2 ⇒ Electronic parts catalogue .*
- *For refrigerant circuits with „Zexel / Valeo“ compressors, use can be made of both the refrigerant oil (G 052 154 A2) and the refrigerant oil (G 052 200 A2) contained in the retrofit kit (part no. 4A0 298 107) ⇒ Electronic parts catalogue .*
- *At present, the electrically driven air conditioner compressor (e.g. of „Denso“ type on the Audi Q5 hybrid) is filled with the same refrigeration oil as the mechanically driven air conditioner compressor of the same manufacturer (refer to rating plate on air conditioner compressor) ⇒ Electronic parts catalogue .*

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10.2.2 Refrigerant oil capacities

Note

- *For air conditioner compressor assignment („Zexel / Valeo“, „Sanden“ or „Denso“), refer to the vehicle-specific workshop manual ⇒ Heating, air conditioning; Rep. gr. 87 or ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*
- *With „Zexel / Valeo“, „Denso“ and „Sanden“ compressors, the amount of refrigerant oil in the replacement compressor corresponds to the total quantity of oil to be added. If the air conditioner compressor is renewed, the quantity of refrigerant oil in the air conditioner compressor to be fitted therefore has to be adjusted (an incorrect refrigerant oil quantity would damage the compressor).*
- *When pouring (flushing) the refrigerant oil out of the replacement compressor (or the defective air conditioner compressor), a small quantity of oil generally remains in the air conditioner compressor (20 to 30 cm^3). This refrigerant oil does not affect the function of the air conditioner and can therefore be ignored (always remains in compressor).*
- *On initial switch-on, the refrigerant oil is distributed throughout the refrigerant circuit.*
- *Unless otherwise stated, the refrigerant oil capacities specified also apply to the corresponding „S“ and „RS“ versions of this vehicle model.*
- *For refrigerant oil topping-up quantities on renewing defective refrigerant circuit components, refer to ⇒ page 246 . Also ⇒ Heating, air conditioning; Rep. gr. 87 , ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*

- ⇒ „10.2.3 Capacities for Audi A1 (8X_) 2011 ➢“, page 291
- ⇒ „10.2.4 Capacities for Audi A2 (8Z_) 2001 ➢“, page 292
- ⇒ „10.2.5 Capacities for Audi A3 (8L_) 1997 ➢ and Audi TT (8N_) 1999 ➢“, page 293
- ⇒ „10.2.6 Capacities for Audi A3 (8P_) 2004 ➢, Audi Q3 (8U_) 2012 ➢“, page 293
- ⇒ „10.2.7 Capacities for Audi TT (8J_) 2007 ➢“, page 295
- ⇒ „10.2.8 Capacities for Audi 80 (8A_/8C_), Audi Coupé (8B_), Audi Cabriolet (8G_) ➢ 2002“, page 296
- ⇒ „10.2.9 Capacities for Audi A4 (8D_) 1995 ➢“, page 297
- ⇒ „10.2.10 Capacities for Audi A4 (8E_) 2001 ➢, Audi A4 Cabriolet (8H_) 2003 ➢“, page 297
- ⇒ „10.2.11 Capacities for Audi A4 (8K_) 2008 ➢, Audi A5 Coupé and Sportback (8T_) 2008 ➢, Audi Q5 (8R_) 2008 ➢, Audi A5 Cabriolet (8F_) 2009 ➢, Audi Q5 hybrid (8R_) 2011 ➢“, page 299
- ⇒ „10.2.12 Capacities for Audi 100 / Audi A6 (4A_) ➢ 1998“, page 300

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- ⇒ „10.2.13 Capacities for Audi A6 (4B_) 1998 ► and Audi allroad ► 2005“, page 301
- ⇒ „10.2.14 Capacities for Audi A6 (4F_) 2005 ►“, page 303
- ⇒ „10.2.15 Capacities for Audi A6 (4G_) 2011 ►, Audi A7 (4G_) 2011 ►“, page 304
- ⇒ „10.2.16 Capacities for Audi V8 (4C_) ► 1994“, page 305
- ⇒ „10.2.17 Capacities for Audi A8 (4D_) 1994 ►“, page 306
- ⇒ „10.2.18 Capacities for Audi A8 (4E_) 2003 ►“, page 306
- ⇒ „10.2.19 Capacities for Audi A8 (4H_) 2010 ►“, page 308
- ⇒ „10.2.20 Capacities for Audi Q7 (4L_) 2006 ►“, page 311
- ⇒ „10.2.21 Capacities for Audi R8 (42_) 2008 ►“, page 312

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10.2.3 Capacities for Audi A1 (8X_) 2011 ►

Characteristics of refrigerant circuit:

- Expansion valve
- Receiver
- Air conditioner compressor from various manufacturers with air conditioner compressor regulating valve -N280- (no magnetic clutch) ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3	Differing characteristics of this refrigerant circuit
Audi A1	From 08.10 onwards	110 + / - 10	110 + / - 10	• „Sanden“ (or „Delphi“) air conditioner compressor
		90 + / - 10	90 + / - 10	„Denso“ air conditioner compressor

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Note

- *The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the air conditioner compressor is therefore to be adjusted ⇒ page 246 .*
- *Different air conditioner compressors are fitted depending on the production period and engine.*
- *At the start of production, „Denso“ type „6 SEU 14C“ or „Sanden“ type „7 PXE 16“ air conditioner compressors were fitted ⇒ Electronic parts catalogue and ⇒ Heating, air conditioning; Rep. gr. 87 .*
- *Depending on the engine, „Delphi“ type „6 CVC 140“ air conditioner compressors may also be fitted at a later date (introduction not yet finalised) ⇒ Electronic parts catalogue and ⇒ Heating, air conditioning; Rep. gr. 87 .*
- *These air conditioner compressors are available as replacement parts with different oil capacities and attention must therefore be paid to the oil quantity in the air conditioner compressor as well as the exact part number ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .*
- *The different oil quantities in the air conditioner compressor may result from the design of the air conditioner compressor (with or without oil separator at high-pressure connection) or, in the case of identical air conditioner compressors, from the design of the refrigerant circuit. Attention is to be paid to these oil quantities. Too much oil in the circuit results in higher pressures and a reduced cooling output of the system. Too little oil may lead to lubrication problems in the air conditioner compressor.*
- *The air conditioner compressor may have been fitted at the factory with a rating plate indicating the part number and the quantity of refrigerant oil in the air conditioner compressor.*

10.2.4 Capacities for Audi A2 (8Z_) 2001 ➢

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- Air conditioner compressor with air conditioner compressor regulating valve -N280- (no magnetic clutch)
- „Denso“ air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3
Audi A2	From 06.00 onwards	180 $^{+}$/ -15	180^{+}/-15

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Note

- *The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the air conditioner compressor is therefore to be adjusted ⇒ page 246 .*
- *As the air conditioner compressor and engine always operate at the same time and the entire quantity of refrigerant oil is contained in the air conditioner compressor, the circuit must be completely assembled before starting the engine ⇒ Heating, air conditioning; Rep. gr. 87 .*
- *As replacement air conditioner compressors of this type are supplied with different oil capacities, the exact part number must be heeded. ⇒ Electronic parts catalogue*

10.2.5 Capacities for Audi A3 (8L_) 1997 ► and Audi TT (8N_) 1999 ►

Characteristics of refrigerant circuit:

- Expansion valve
- Receiver
- „Sanden“ or „Zexel / Valeo“ air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue

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Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3
Audi A3	From 08.96 onwards	135 + / -15	135+/-15
Audi TT	From 10.98 onwards	135 + / -15	135+/-15

Note

- *The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the air conditioner compressor is therefore to be adjusted ⇒ page 246 .*
- *Exclusive use was made at the start of production of „Sanden“ air conditioner compressors. With effect from Model Year 1999, use has also been made of „Zexel / Valeo“ air conditioner compressors ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*

10.2.6 Capacities for Audi A3 (8P_) 2004 ►, Audi Q3 (8U_) 2012 ►

Note

The capacity for the Audi A3 also applies to the Audi A3 Sportback, the Audi RS3 and the Audi A3 Cabriolet.

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Characteristics of refrigerant circuit:

- Expansion valve
- Receiver
- Air conditioner compressor from various manufacturers with air conditioner compressor regulating valve -N280- (no magnetic clutch) ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3	Differing characteristics of this refrigerant circuit
Audi A3 Audi Q3	From 05.03 to 10.03	180 $^{+}$ / $_{-}$ 10	180 $^{+}$ / $_{-}$ 10	• „Denso“ air conditioner compressor of „7 SEU 16“ type
	From 10.03 onwards	120 $^{+}$ / $_{-}$ 10	120 $^{+}$ / $_{-}$ 10	• „Zexel / Valeo“ air conditioner compressor
		110 $^{+}$ / $_{-}$ 10	110 $^{+}$ / $_{-}$ 10	• „Sanden“ air conditioner compressor
		140 $^{+}$ / $_{-}$ 10	140 $^{+}$ / $_{-}$ 10	• „Denso“ air conditioner compressor of „7 SEU 17“ type
	From 06.07 onwards	90 $^{+}$ / $_{-}$ 10	90 $^{+}$ / $_{-}$ 10	• „Denso“ air conditioner compressor of „6 SEU 14“ type
	From 08.07 onwards	110 $^{+}$ / $_{-}$ 10	110 $^{+}$ / $_{-}$ 10	• „Delphi“ air conditioner compressor

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Note

- *The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the air conditioner compressor is therefore to be adjusted ⇒ page 246 .*
- *Different air conditioner compressors are fitted depending on the production period and engine.*
- *At the start of production, exclusive use was made of air conditioner compressors of type „7 SEU 16“ from „Denso“ (e.g. air conditioner compressor with part no. 1K0 820 803 up to index „D“). In Model Year 2004 (as of approx. 10.03), a gradual change was made to a different type of „Denso“ compressor („7 SEU 17“ e.g. air conditioner compressor with part no. 1K0 820 803 as of index „E“).*
- *With effect from Model Year 2004 (as of approx. 10.03), „Zexel / Valeo“ (type „DSC17E“) and „Sanden“ (type „PXE16“) air conditioner compressors are also gradually being introduced depending on the engine ⇒ Electronic parts catalogue .*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*
- *With effect from Model Year 2008, „Denso“ (type „6 SEU 14“) and „Delphi“ air conditioner compressors were gradually introduced depending on the engine ⇒ Electronic parts catalogue and ⇒ Heating, air conditioning; Rep. gr. 87 .*
- *This air conditioner compressor is available as a replacement part with different oil capacities and attention must therefore be paid to the oil quantity in the air conditioner compressor as well as the exact part number ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .*
- *The different oil quantities in the air conditioner compressor may result from the design of the air conditioner compressor (with or without oil separator at high-pressure connection) or, in the case of identical air conditioner compressors, from the design of the refrigerant circuit. Attention is to be paid to these oil quantities. Too much oil in the circuit results in higher pressures and a reduced cooling output of the system. Too little oil may lead to lubrication problems in the air conditioner compressor.*
- *The air conditioner compressor may have been fitted at the factory with a rating plate indicating the part number and the quantity of refrigerant oil in the air conditioner compressor.*
-

10.2.7 Capacities for Audi TT (8J_) 2007 ➢

Characteristics of refrigerant circuit:

- Expansion valve
- Receiver
- „Denso“ or „Sanden“ air conditioner compressor with air conditioner compressor regulating valve -N280- (no magnetic clutch) ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue

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Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3	Differing characteristics of this refrigerant circuit
Audi TT	From 08.06 onwards	90 + / - 10	90 + / - 10	• „Denso“ air conditioner compressor of „6 SEU 14“ type
		110 + / - 10	110 + / - 10	• „Sanden“ air conditioner compressor

Note

- *The replacement air conditioner compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the air conditioner compressor is therefore to be adjusted ⇒ page 246 .*
- *At the start of production, exclusive use was made of air conditioner compressors of type „6 SEU 14“ manufactured by „Denso“. This air conditioner compressor has no magnetic clutch (it is constantly driven by the engine). Different makes of air conditioner compressor may also be fitted at a later date depending on the engine ⇒ Electronic parts catalogue and ⇒ Heating, air conditioning; Rep. gr. 87 .*
- *As of Model Year 2008, air conditioner compressors manufactured by „Sanden“ (type „PXE16“) were also gradually introduced for certain engines. This air conditioner compressor has no magnetic clutch (it is constantly driven by the engine) ⇒ Electronic parts catalogue and ⇒ Heating, air conditioning; Rep. gr. 87 .*
- *This air conditioner compressor is available as a replacement part with different oil capacities and attention must therefore be paid to the oil quantity in the air conditioner compressor as well as the exact part number ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .*
- *The different oil quantities in the air conditioner compressor may result from the design of the air conditioner compressor (with or without oil separator at high-pressure connection) or, in the case of identical air conditioner compressors, from the design of the refrigerant circuit. Attention is to be paid to these oil quantities. Too much oil in the circuit results in higher pressures and a reduced cooling output of the system. Too little oil may lead to lubrication problems in the air conditioner compressor.*
- *The air conditioner compressor may have been fitted at the factory with a rating plate indicating the part number and the quantity of refrigerant oil in the air conditioner compressor.*

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10.2.8 Capacities for Audi 80 (8A_/8C_), Audi Coupé (8B_), Audi Cabriolet (8G_) ► 2002

Characteristics of refrigerant circuit:

- Restrictor (not coloured).
- Reservoir
- „Zexel / Valeo“ air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue

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Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3
Audi 80 Audi Coupé Audi Cabriolet	From 10.92 onwards	250 + 50	250 + 50

Note

- *The replacement compressor contains the full quantity of oil intended for the circuit. On replacement, the quantity of oil in the air conditioner compressor is therefore to be adjusted ⇒ page 246 .*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*

10.2.9 Capacities for Audi A4 (8D_) 1995 ►

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- „Denso“ or „Zexel / Valeo“ air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue

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Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3
Audi A4	From 11.94 onwards	250 + 50	250 + 50

Note

- *The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the air conditioner compressor is therefore to be adjusted ⇒ page 246 .*
- *The Audi A4 is fitted with different air conditioner compressors depending on the engine and production period ⇒ Heating, air conditioning; Rep. gr. 87 and ⇒ Electronic parts catalogue .*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*

10.2.10 Capacities for Audi A4 (8E_) 2001 ►, Audi A4 Cabriolet (8H_) 2003 ►

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- „Denso“ air conditioner compressor with air conditioner compressor regulating valve -N280- (no magnetic clutch) ⇒ Air

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conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3	Differing characteristics of this refrigerant circuit
Audi A4 Audi RS 4	From 11.00 to 01.04 • All	180 + / - 10	180 + / - 10	• Air conditioner compressor type „6 SEU 12“ „6 SEU 14“ „7 SEU 16“ or „7 SEU 17“ (refer to notes below)
	From 01.04 onwards • All except 8-cyl. engine	120 + / - 10	120 + / - 10	• Air conditioner compressor type „6 SEU 14“ or „7 SEU 17“ (refer to notes below)
	From 01.04 onwards • 8-cyl. engine only	130 + / - 10	130 + / - 10	• Air conditioner compressor type „7 SEU 17“ (refer to notes below)

Note

- *The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the air conditioner compressor is therefore to be adjusted ⇒ page 246 .*
- *The Audi A4 is fitted with different air conditioner compressors depending on the engine and production period. As replacement air conditioner compressors of this type are supplied with different oil capacities, the exact part no. must be heeded ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*
- *At the start of production, the compressor types in the first line of the table were supplied with a refrigerant oil quantity of 180 cm^3. These air conditioner compressors can be recognised from the index of the part number (8E0 260 805 with one index or with double index up to „AH“). In Model Year 2004 (as of approx. 01.04), a gradual change was made to other types of compressor with a refrigerant oil quantity of 120 cm^3 or 130 cm^3. These air conditioner compressors can be recognised from the index of the part number 8E0 260 805 (with double index as of „ AJ“) or 4F0 260 805 (and index „E“ for vehicles with 8-cyl. engine) ⇒ Electronic parts catalogue .*
- *The different oil quantities in the air conditioner compressor may result from the design of the air conditioner compressor (with or without oil separator at high-pressure connection) or, in the case of identical air conditioner compressors, from the design of the refrigerant circuit. Attention is to be paid to these oil quantities. Too much oil in the circuit results in higher pressures and a reduced cooling output of the system. Too little oil may lead to lubrication problems in the air conditioner compressor.*
- *The air conditioner compressor may have been fitted at the factory with a rating plate indicating the part number and the quantity of refrigerant oil in the air conditioner compressor.*

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10.2.11 Capacities for Audi A4 (8K_) 2008 ►, Audi A5 Coupé and Sportback (8T_) 2008 ►, Audi Q5 (8R_) 2008 ►, Audi A5 Cabriolet (8F_) 2009 ►, Audi Q5 hybrid (8R_) 2011 ►

Characteristics of refrigerant circuit:

- Expansion valve
- Receiver
- Refrigerant line with internal heat exchanger
- „Denso“ air conditioner compressor with air conditioner compressor regulating valve -N280- ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3	Differing characteristics of this refrigerant circuit
Audi A4	From 05.07 onwards	150 + / - 10	150 + / - 10	• „Denso“ air conditioner compressor of „6 SEU 14“ and „7 SEU 17“ type
	From 08.11 onwards	80 + / - 10	80 + / - 10	• „Denso“ air conditioner compressor of „6 SAS 14“ type with magnetic clutch
Audi A5 Coupé and Sportback	From 05.07 onwards	150 + / - 10	150 + / - 10	• „Denso“ air conditioner compressor of „6 SEU 14“ and „7 SEU 17“ type
	From 08.11 onwards	80 + / - 10	80 + / - 10	• „Denso“ air conditioner compressor of „6 SAS 14“ type with magnetic clutch
Audi Q5	From 09.08 onwards	150 + / - 10	150 + / - 10	• „Denso“ air conditioner compressor of „6 SEU 14“ and „7 SEU 17“ type
	From 08.11 onwards	80 + / - 10	80 + / - 10	• „Denso“ air conditioner compressor of „6 SAS 14“ type with magnetic clutch
Audi Q5 hybrid	From 05.11 onwards	160 + / - 20	160 + / - 20	• Electrically driven air conditioner compressor manufactured by „Denso“
Audi A5 Cabriolet	From 03.09 onwards	150 + /- 10	150 + / - 10	• „Denso“ air conditioner compressor of „6 SEU 14“ and „7 SEU 17“ type
	From 08.11 onwards	80 + / - 10	80 + / - 10	• „Denso“ air conditioner compressor of „6 SAS 14“ type with magnetic clutch

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Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3	Differing characteristics of this refrigerant circuit
Audi RS 5	From 03.10 onwards	150 + /- 10	150 + / - 10	• „Denso“ air conditioner compressor „7 SEU 17“

Note

- *The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the air conditioner compressor is therefore to be adjusted ⇒ page 246 .*
- *The air conditioner compressors fitted at the start of production are manufactured by „Denso“ (type „6 SEU 14“) for vehicles with 4 and 6-cyl. engine and type „7 SEU 17“ for vehicles with 8-cyl. engine); this air conditioner compressor has no magnetic clutch (it is constantly driven by the engine). Different makes of air conditioner compressor may also be fitted at a later date depending on the engine ⇒ Electronic parts catalogue and ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *As of Model Year 2012, air conditioner compressors with an air conditioning system magnetic clutch -N25- fitted at the pulley are additionally to be introduced for certain engines and models ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*
- *This air conditioner compressor is available as a replacement part with different oil capacities and attention must therefore be paid to the oil quantity in the air conditioner compressor as well as to the exact part number ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*
- *The different oil quantities in the air conditioner compressor may result from the design of the air conditioner compressor (with or without oil separator at high-pressure connection) or, in the case of identical air conditioner compressors, from the design of the refrigerant circuit. Attention is to be paid to these oil quantities. Too much oil in the circuit results in higher pressures and a reduced cooling output of the system. Too little oil may lead to lubrication problems in the air conditioner compressor.*
- *The air conditioner compressor may have been fitted at the factory with a rating plate indicating the part number and the quantity of refrigerant oil in the air conditioner compressor.*

10.2.12 Capacities for Audi 100 / Audi A6 (4A_) ► 1998

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- „Denso“ or „Zexel / Valeo“ air conditioner compressor ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

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Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3
Audi 100 / Audi A6	From 10.92 to 03.97	250 + 50	250 + 50

Note

- *The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the air conditioner compressor is therefore to be adjusted* *⇒ page 246* *.*
- *The Audi 100 / Audi A6 features different air conditioner compressors depending on the engine and production period. Exclusive use was made at the start of production of „Zexel / Valeo“ air conditioner compressors. As of Model Year 1996, „Denso“ air conditioner compressors were gradually introduced for vehicles with 6-cylinder engines ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*

10.2.13 Capacities for Audi A6 (4B_) 1998 ► and Audi allroad ► 2005

Characteristics of refrigerant circuit:

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- Restrictor
- Reservoir
- „Denso“ or „Zexel / Valeo“ air conditioner compressor with air conditioning system magnetic clutch -N25- ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3	Differing characteristics of this refrigerant circuit
Audi A6/Audi allroad • 4-cyl. petrol engine except 2.0 l • 6-cyl. petrol engine except 3.0 l	From 04.97 onwards All	250 + 50	250 + 50	• Refer to notes below.
Audi A6/Audi allroad • 4-cyl. diesel engine • 6-cyl. diesel engine (see notes for Audi allroad)	From 04.97 to 05.01	250 + 50	250 + 50	• Refer to notes below.

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Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3	Differing characteristics of this refrigerant circuit
Audi A6 • 8-cyl. engine (with toothed belt camshaft drive)	From 04.97 onwards All	250 + 50	250 + 50	• Refer to notes below.

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Note

- *The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the air conditioner compressor is therefore to be adjusted ⇒ page 246 .*
- *The Audi A6 is fitted with different air conditioner compressors depending on the engine and production period.*
- *As of Model Year 2002, the Audi A6 features air conditioner compressors with a magnetic clutch or regulating valve (different oil quantities) depending on the engine. This change is being introduced gradually for the Audi allroad with 6-cyl. diesel engine in Model Year 2003 ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- „Denso“ air conditioner compressor with air conditioner compressor regulating valve -N280- ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue
-

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3	Differing characteristics of this refrigerant circuit
Audi A6 • 4-cyl. petrol engine 2.0 l • 6-cyl. petrol engine 3.0 l	All	220 + 20	220 + 20	Air conditioner compressor type „6 SEU 12“ or „7 SEU 16“ (refer to notes below)
Audi A6/Audi allroad • 4-cyl. diesel engine • 6-cyl. diesel engine (see notes for Audi allroad)	From 05.01 onwards	245 + 20	245 + 20	Air conditioner compressor type „6 SEU 12“ or „7 SEU 16“ (refer to notes below)

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Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3	Differing characteristics of this refrigerant circuit
Audi allroad • 8-cyl. engine (with chain-driven camshaft)	All	220 + 20	220 + 20	Air conditioner compressor type „7 SEU 17“ (refer to notes below)

Note

- *The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the air conditioner compressor is therefore to be adjusted ⇒ page 246 .*
- *The Audi A6 is fitted with different air conditioner compressors depending on the engine and production period.*
- *As of Model Year 2002, the Audi A6 features air conditioner compressors with a magnetic clutch or regulating valve (different oil quantities) depending on the engine. This change is being introduced gradually for the Audi allroad with 6-cyl. diesel engine in Model Year 2003.*
- *As the replacement air conditioner compressor with air conditioner compressor regulating valve -N280- is supplied with different oil capacities, the exact part number must be heeded ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*
- *The different oil quantities in the air conditioner compressor may result from the design of the air conditioner compressor (with or without oil separator at high-pressure connection) or, in the case of identical air conditioner compressors, from the design of the refrigerant circuit. Attention is to be paid to these oil quantities. Too much oil in the circuit results in higher pressures and a reduced cooling output of the system. Too little oil may lead to lubrication problems in the air conditioner compressor.*
- *The air conditioner compressor may have been fitted at the factory with a rating plate indicating the part number and the quantity of refrigerant oil in the air conditioner compressor.*

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10.2.14 Capacities for Audi A6 (4F_) 2005 ►

Note

Also applies to the Audi S6 and Audi RS 6.

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- „Denso“ air conditioner compressor with air conditioner compressor regulating valve -N280- ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

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Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3
Audi A6/S6	From 04.04 onwards	130 + / - 10	130 + / - 10
Audi RS 6	From 05.08 onwards	130 + / - 10	Depending on the version of the air conditioner compressor (refer to note below) ♦ 130 + / - 10

Note

- *The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the air conditioner compressor is therefore to be adjusted.*
- *The Audi A6 is fitted with different air conditioner compressors depending on the engine and production period.*
- *As there are different versions of this type of replacement air conditioner compressor, the exact part no. must be heeded ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*
- *The air conditioner compressor may have been fitted at the factory with a rating plate indicating the part number and the quantity of refrigerant oil in the air conditioner compressor.*
- *On account of the different test bench procedure for this engine, the 10-cyl. TFSI engine (Audi RS 6) is fitted at the factory with an air conditioner compressor with a smaller quantity of refrigeration oil (70 + / - 10 cm^3) than for the 10-cyl. FSI engine (Audi S6) and the other engines (130 + / - 10 cm^3) (at present, the air conditioner compressors on the 10-cyl. FSI and the 10-cyl. TFSI only differ in terms of the part number and the quantity of refrigeration oil; refer also to the air conditioner compressor rating plate). To adjust the total quantity of oil in the refrigerant circuit at the factory, the missing amount of oil in the air conditioner compressor (60 + / - 10 cm^3) with the 10-cyl. TFSI engine (Audi RS 6) is added at a different point in the refrigerant circuit. This is not necessary when performing service work, as replacement air conditioner compressors are only supplied with the original quantity of oil (130 + / - 10 cm^3) (would only be required as part of service work if a new air conditioner compressor with the smaller quantity of oil were to be installed) ⇒ Electronic parts catalogue .*

10.2.15 Capacities for Audi A6 (4G_) 2011 ►, Audi A7 (4G_) 2011 ►

Characteristics of refrigerant circuit:

- Expansion valve
- Receiver
- Refrigerant line with internal heat exchanger
- „Denso“ air conditioner compressor with air conditioner compressor regulating valve -N280- ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

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Audi
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Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3	Differing characteristics of this refrigerant circuit
Audi A6	From 02.11 onwards	120 + / - 10	120 + / - 10	• „Denso“ air conditioner compressor of „6 SEU 14“ type with oil separator
Audi A7	From 10.10 onwards	120 + / - 10	120 + / - 10	• „Denso“ air conditioner compressor of „6 SEU 14“ type with oil separator

Note

- *The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the air conditioner compressor is therefore to be adjusted ⇒ page 246 .*
- *The air conditioner compressors fitted at the start of production are manufactured by „Denso“ (type „6 SEU 14“). Different makes of air conditioner compressor or another type of compressor may also be fitted at a later date ⇒ Electronic parts catalogue and ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual).*
- *This air conditioner compressor is available as a replacement part with different oil capacities and attention must therefore be paid to the oil quantity in the air conditioner compressor as well as to the exact part number ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*
- *The different oil quantities in the air conditioner compressor may result from the design of the air conditioner compressor (with or without oil separator at high-pressure connection) or, in the case of identical air conditioner compressors, from the design of the refrigerant circuit. Attention is to be paid to these oil quantities. Too much oil in the circuit results in higher pressures and a reduced cooling output of the system. Too little oil may lead to lubrication problems in the air conditioner compressor.*
- *The air conditioner compressor may have been fitted at the factory with a rating plate indicating the part number and the quantity of refrigerant oil in the air conditioner compressor.*

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10.2.16 Capacities for Audi V8 (4C_) ► 1994

Characteristics of refrigerant circuit:

- Restrictor (not coloured).
- Reservoir
- Air conditioner compressor from „Zexel / Valeo“ ⇒ Heating, air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3
Audi V8	From 10.92 to 10.93	250 + 50	250 + 50

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Note

- *The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the air conditioner compressor is therefore to be adjusted ⇒ page 246 .*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*

10.2.17 Capacities for Audi A8 (4D_) 1994 ►

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- „Denso“ or „Zexel / Valeo“ air conditioner compressor ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3
Audi A8	From 05.94 onwards	250 + 50	250 + 50

Note

- *The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the air conditioner compressor is therefore to be adjusted ⇒ page 246 .*
- *Exclusive use was made at the start of production of „Zexel / Valeo“ air conditioner compressors. As of Model Year 1996, production was gradually switched to „Denso“ air conditioner compressors ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*

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10.2.18 Capacities for Audi A8 (4E_) 2003 ►

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- „Denso“ air conditioner compressor with air conditioner compressor regulating valve -N280- ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

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Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3	Differing characteristics of this refrigerant circuit
Audi A8 • 8-cyl. petrol engine with 3.7 l or 4.2 l (except FSI)	10.02 onwards All	200 $^{+}$ / - 10	200^{+} / - 10	Air conditioner compressor type „7 SEU 16“ (refer to notes below)
• 6 and 12-cyl. petrol engine • 6 and 8-cyl. diesel engine	From 10.02 to 01.04	200^{+}/ - 10	200^{+}/ - 10	Air conditioner compressor type „6 SEU 14“, „7 SEU 16“ or „7 SEU 17“ (refer to notes below)
• 6, 10 and 12-cyl. petrol engine • 6 and 8-cyl. diesel engine • 8-cyl. 4.2 l petrol engine (FSI only)	From 01.04 onwards	150 $^{+}$ / - 10	150^{+} / - 10	Air conditioner compressor type „6 SEU 14“ or „7 SEU 17“ (refer to notes below)

Note

- *The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the air conditioner compressor is therefore to be adjusted ⇒ page 246 .*
- *The Audi A8 is fitted with different air conditioner compressors depending on the engine and production period.*
- *As replacement air conditioner compressors of this type are supplied with different oil capacities, the exact part number must be heeded ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue .*
- *At the start of production, the compressor types in the first two lines of the table were supplied with a refrigerant oil quantity of 200 cm^3. These air conditioner compressors can be recognised from the index of the part number (4E0 260 805 with index „C“, „D“, „E“, „F“, „J“, „L“ or „S“). In Model Year 2004 (as of approx. 01.04), a gradual change was made to other types of compressor with a refrigerant oil quantity of 150 cm^3. These air conditioner compressors can be recognised from the index of the part number (4E0 260 805 with index „G“, „H“, „T“, „M“, „N“, „Q“ or double index e.g. „AB“) ⇒ Electronic parts catalogue .*
- *The different oil quantities in the air conditioner compressor may result from the design of the air conditioner compressor (with or without oil separator at high-pressure connection) or, in the case of identical air conditioner compressors, from the design of the refrigerant circuit. Attention is to be paid to these oil quantities. Too much oil in the circuit results in higher pressures and a reduced cooling output of the system. Too little oil may lead to lubrication problems in the air conditioner compressor.*
- *The air conditioner compressor may have been fitted at the factory with a rating plate indicating the part number and the quantity of refrigerant oil in the air conditioner compressor.*

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10.2.19 Capacities for Audi A8 (4H_) 2010 ►

Characteristics of refrigerant circuit:

- Expansion valve
- With one or two evaporator(s) depending on equipment
- Refrigerant line with internal heat exchanger
- Dryer cartridge in receiver at condenser
- „Denso“ air conditioner compressor with air conditioner compressor regulating valve -N280- ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

Caution

Different refrigerant and refrigeration oil capacity for vehicles with an 8-cyl. TDI engine

- ***On account of the installation position of the air conditioner compressor (at the top of the engine), the quantity of refrigeration oil differs on vehicles with an 8-cyl. TDI engine from that on the rating plate of the air conditioner compressor***

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3	Differing characteristics of this refrigerant circuit
Audi A8 (all except 8-cyl. TDI engine)	From 03.10 onwards			
♦ Vehicle with one evaporator		$130^{+}/_{-}10$	♦ $130^{+}/_{-}10$	• One evaporator
♦ Vehicle with two evaporators		$130^{+}/_{-}10$		• Two evaporators (refer to notes below)
Audi A8 (only 8-cyl. TDI engine)				
♦ Vehicle with one evaporator		$180^{+}/_{-}10$	♦ $130^{+}/_{-}10$	• One evaporator

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Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3	Differing characteristics of this refrigerant circuit
♦ Vehicle with two evaporators		$180^{+}/_{-}$ 10		• Two evaporators (refer to notes below)

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Note

- *The replacement compressor contains a certain amount of refrigeration oil (currently 130 + / - 10 cm^3 depending on the air conditioner compressor, refer to rating plate). With the exception of vehicles with an 8-cyl. TDI engine, this quantity of refrigeration oil corresponds at present to the quantity of oil specified for this refrigerant circuit on vehicles with one or two evaporators (see below for vehicles with an 8-cyl. TDI engine). At present, vehicles with two evaporators are filled with the same amount of oil as vehicles with one evaporator. On account of the longer refrigerant lines and the second evaporator, no greater quantity of refrigerant oil is currently required in the refrigerant circuit on this vehicle. With this vehicle, the design of the refrigerant circuit means that only a small proportion of the refrigerant oil passes into the refrigerant lines to the second evaporator and into the second evaporator during air conditioner operation. If the air conditioner compressor is replaced after cleaning the refrigerant circuit, it is therefore not necessary on vehicles with two evaporators (on account of the second evaporator) to pour additional refrigeration oil into the refrigerant circuit. If the air conditioner compressor is replaced without having to clean the refrigerant circuit, the quantity of refrigerant oil in the new air conditioner compressor to be fitted should be adjusted in line with the quantity of oil poured out of the old compressor ⇒ page 246 .*
- *On vehicles with an 8-cyl. TDI engine, the quantity of refrigeration oil in the refrigerant circuit was increased as of vehicle identification number 4H_ BN 018846 from 130 ccm to 180 ccm . Accordingly, the refrigerant capacity thus had to be reduced slightly. As the capacity specification on the label has not yet been changed, proceed as follows: On vehicles manufactured up to the vehicle identification number mentioned, check whether the refrigerant oil has already been topped up during a previous workshop visit. If not, add 50 ccm of refrigerant oil to the refrigerant circuit. Then correspondingly alter the refrigerant capacity specified on the label in waterproof ink and fill the refrigerant circuit with the specified quantity of refrigerant. Finally make a record of the change made in the vehicle data. On vehicles manufactured as of the vehicle identification number mentioned, check the refrigerant capacity specified on the label, alter accordingly in waterproof ink if applicable and then fill the refrigerant circuit with the specified quantity of refrigerant.*
- *Vehicles with an 8-cyl. TDI engine up to vehicle identification number 4H_ BN 018845 were filled at the factory with the same quantity of refrigeration oil as for the other engines. As of vehicle identification number 4H_ 018846, the refrigerant circuit on vehicles with an 8-cyl. TDI engine is filled at the factory with a larger quantity of refrigeration oil. This quantity of refrigeration oil applies retroactively to all vehicles with an 8-cyl. TDI engine. If the refrigerant circuit is re-charged on vehicles with an 8-cyl. TDI engine or the air conditioner compressor is replaced for example after cleaning the refrigerant circuit, the quantity of refrigeration oil in the refrigerant circuit is to be checked and topped up if necessary or the correct quantity must be added (e.g. at open pipes or component connections or by way of the air conditioner service station prior to filling with refrigerant). If the air conditioner compressor is replaced without having to clean the refrigerant circuit, the quantity of refrigeration oil in the new air conditioner compressor to be fitted should be adjusted in line with the quantity of oil poured out of the old air conditioner compressor (and topped up accordingly if necessary on vehicles up to the vehicle identification number specified above) ⇒ page 246 .*
- *The different oil quantities in the air conditioner compressor may result from the design of the air conditioner compressor (with or without oil separator at high-pressure connection) or, in the case of identical air conditioner compressors, from the design of the refrigerant circuit. Attention is to be paid to these oil quantities. Too much oil in the circuit results in higher pressures and a reduced cooling output of the system. Too little oil*

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10.2.20 Capacities for Audi Q7 (4L_) 2006 ►

Characteristics of refrigerant circuit:

- Expansion valve
- With one or two evaporator(s) depending on equipment
- Dryer cartridge in receiver at condenser
- „Denso“ air conditioner compressor with air conditioner compressor regulating valve -N280- ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3	Differing characteristics of this refrigerant circuit
Audi Q7	From 02.06 onwards			
♦ Vehicle with one evaporator		$145^{+}/_{-}15$	♦ $150^{+}/_{-}10$ (air conditioner compressor for a vehicle with a 8-cyl. engine) ♦ $140^{+}/_{-}10$ (air conditioner compressor for a vehicle with a 6-cyl. engine)	• One evaporator • Air conditioner compressor type „7 SEU 16“ (refer to notes below)
♦ Vehicle with two evaporators		$245^{+}/_{-}15$		• Two evaporators (refer to notes below)

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Note

- *The replacement compressor contains a certain quantity of refrigerant oil (at present 140 or 150 + / - 10 cm^3, depending on the air conditioner compressor). This quantity of refrigerant oil corresponds to the quantity of oil specified for this refrigerant circuit on vehicles with one evaporator. On account of the greater refrigerant line length and the second evaporator, vehicles with two evaporators require more refrigerant oil in the refrigerant circuit (currently an additional 100 cm^3). If the air conditioner compressor is replaced after cleaning the refrigerant circuit, this quantity of refrigerant oil therefore has to be added to the refrigerant circuit on vehicles with two evaporators (e.g. poured into open lines or component connections). If the air conditioner compressor is replaced without having to clean the refrigerant circuit, the quantity of refrigerant oil in the new air conditioner compressor to be fitted should be adjusted in line with the quantity of oil poured out of the old compressor* ⇒ page 246 .
- *As replacement air conditioner compressors are supplied with different oil capacities, the exact part number must be heeded ⇒ Electronic parts catalogue .*
- *The different oil quantities in the air conditioner compressor may result from the design of the air conditioner compressor (with or without oil separator at high-pressure connection) or, in the case of identical air conditioner compressors, from the design of the refrigerant circuit. Attention is to be paid to these oil quantities. Too much oil in the circuit results in higher pressures and a reduced cooling output of the system. Too little oil may lead to lubrication problems in the air conditioner compressor.*
- *Too much oil in the circuit results in higher pressures and reduced air conditioner cooling output. Too little oil may lead to lubrication problems in the air conditioner compressor. The specified refrigerant oil quantities are therefore to be heeded.*
- *The air conditioner compressor may have been fitted at the factory with a rating plate indicating the part number and the quantity of refrigerant oil in the air conditioner compressor.*

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10.2.21 Capacities for Audi R8 (42_) 2008 ►

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- Two series-connected condensers
- „Denso“ air conditioner compressor with air conditioner compressor regulating valve -N280- ⇒ Air conditioning; Rep. gr. 87 (vehicle-specific workshop manual) and ⇒ Electronic parts catalogue

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm^3	Quantity of refrigerant oil in replacement compressor in cm^3	Differing characteristics of this refrigerant circuit
Audi R8	From 03.07 onwards	150 + /- 10	150+ / - 10	Air conditioner compressor type „7 SEU 17“

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Note

- *The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the air conditioner compressor is therefore to be adjusted ⇒ page 246 .*
- *As replacement air conditioner compressors are supplied with different oil capacities, the exact part number must be heeded ⇒ Electronic parts catalogue .*
- *The different oil quantities in the air conditioner compressor may result from the design of the air conditioner compressor (with or without oil separator at high-pressure connection) or, in the case of identical air conditioner compressors, from the design of the refrigerant circuit. Attention is to be paid to these oil quantities. Too much oil in the circuit results in higher pressures and a reduced cooling output of the system. Too little oil may lead to lubrication problems in the air conditioner compressor.*
- *Too much oil in the circuit results in higher pressures and reduced air conditioner cooling output. Too little oil may lead to lubrication problems in the air conditioner compressor. The specified refrigerant oil quantities are therefore to be heeded.*
- *The air conditioner compressor may have been fitted at the factory with a rating plate indicating the part number and the quantity of refrigerant oil in the air conditioner compressor.*

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11 Test equipment and tools

- List of testers, tools and materials ⇒ page 314 .
- Tools and materials available from regional sales centre or importer ⇒ page 316 .
- Commercially available tools and materials ⇒ page 319 .
- Improvised tools ⇒ page 320 .

11.1 List of testers, tools and materials

Note

This list outlines the testers, tools and materials required for expert refrigerant circuit repair work.

- Tools and materials available from regional sales centre or importer ⇒ page 314 .
- Commercially available tools and materials ⇒ page 315 .
- Improvised tools ⇒ page 316 .

11.1.1 Tools and materials available from regional sales centre or importer

Overview	Page
Air conditioner service station with flushing kit (for currently available air conditioner service stations, refer to ⇒ V.A.G Workshop equipment catalogue) – With integrated program for flushing refrigerant circuit with refrigerant R134a as well as the corresponding flushing kit	Refer to illustration and ⇒ V.A.G Workshop equipment catalogue
Flushing kit for refrigerant circuits (currently available flushing kits) ⇒ V.A.G Workshop equipment catalogue – For flushing the refrigerant circuit with refrigerant R134a; also for use with older air conditioner service stations with a vessel for at least 10 kg of refrigerant R134a (flushing must be performed manually)	⇒ V.A.G Workshop equipment catalogue
Adapter set for refrigerant circuits -VAS 6338/1- – For connecting air conditioner service station to refrigerant circuit and for bridging certain removed components when flushing	⇒ V.A.G Workshop equipment catalogue
Leak detector V.A.G 1796	Refer to illustration
Puller for magnetic clutch (Zexel / Valeo air conditioner compressor) V.A.G 1719	Refer to illustration
Adapter set for refrigerant circuit R134a V.A.G 1785/1-10 – For connecting air conditioner service station to refrigerant circuit and for bridging certain components on flushing and blowing out	Refer to illustration
Valve adapter V.A.G 1785/9 and V.A.G 1785/10	Refer to illustration
Adapter set with service connection V.A.G 1786	Refer to illustration
Combined fine filter unit for compressed-air system (oil, dirt and water separator as used for painting facilities) ⇒ Workshop equipment catalogue	Refer to illustration
O-rings ⇒ Electronic parts catalogue	Refer to illustration
Refrigerant oil ⇒ Electronic parts catalogue	Refer to illustration

Audi
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Overview	Page
Leak detection system VAS 6201 comprising: ♦ Hand pump with low-pressure service hose, service coupling and non-return valve VAS 6201/1 ♦ Cartridge VAS 6201/2 ♦ Cleaning solution VAS 6201/3 ♦ UV leak detection lamp VAS 6201/4 ♦ Replacement bulb for leak detection lamp VAS 6201/5 ♦ Eye protection VAS 6201/6 ♦ Sticker VAS 6201/7 ♦ Protective gloves VAS 6201/9 ♦ Filler tube VAS 6201/8 ♦ System case VAS 6201/10	Refer to illustration
Adapter set for service connections	Refer to illustration and ⇒ V.A.G Workshop equipment catalogue
Release tools for refrigerant line -T40149/-	⇒ V.A.G Workshop equipment catalogue
Disassembly tool for refrigerant line quick-release couplings -T40232-	⇒ V.A.G Workshop equipment catalogue

11.1.2 Commercially available tools and materials

Overview	Page
Fin comb	Refer to illustration
Charging hoses 5/8" - 18 UNF with valve opener	Refer to illustration
Connection piece for refrigerant cylinder and seal with quick-release coupling connection or threaded connection 5/8" - 18 UNF	Refer to illustration
Valve caps 5/8"-18 UNF	Refer to illustration
Pressure gauge set with pressure reducer for nitrogen	Refer to illustration
Quick-release coupling adapter for service connections (2x included in scope of delivery of air conditioner service station)	Refer to illustration
Open-ring spanner, size according to bolted joints at refrigerant pipes	Not illustrated
Valve opener for charging hoses	Not illustrated
Connecting nipple for conical seal 5/8"-18 UNF	Not illustrated
Compressed-air gun with rubber end piece	Not illustrated
Valve opener for Schrader valve	Not illustrated
Hand shut-off valve 5/8"-18 UNF	Not illustrated
Recycling container for refrigerant R134a	Not illustrated
Digital thermometer	Not illustrated
Protective gloves	Not illustrated
Safety goggles	Not illustrated
Refrigerant R134a with cylinder (capacity as required)	Not illustrated

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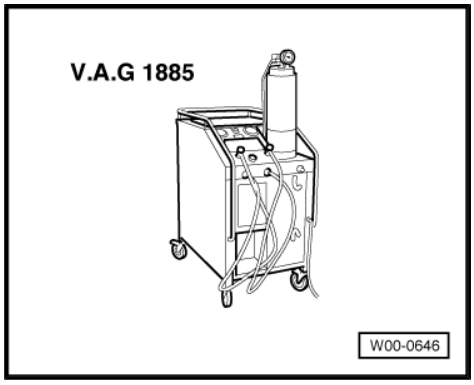
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11.1.3 Improvised tools

Overview	Page
Charging hose with connection to workshop compressed air system	Not illustrated

11.2 Tools and materials available from regional sales centre or importer

Service station / air conditioner service station (this illustration shows V.A.G 1885 for example; for currently available air conditioner service stations, refer to ⇒ V.A.G workshop equipment catalogue)

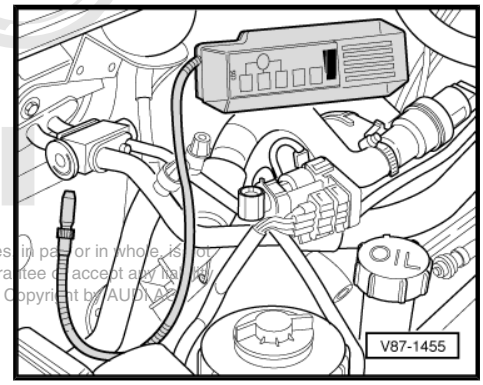


- The operations "testing, extraction (recycling), evacuation, flushing and charging" must be performed according to the relevant operating instructions.
- The filters and dryers fitted must be renewed at the latest at the end of the period of use specified in the operating instructions and each time the station is drained (have replacement filter to hand). Available from equipment manufacturer; refer to the operating instructions for the air conditioner service station.
- Air conditioner service stations not shown here can also be used ⇒ V.A.G Workshop equipment catalogue .
- Currently available air conditioner service stations are provided with a refrigerant circuit flushing program. The scope of delivery of these air conditioner service stations also includes the necessary flushing attachment ⇒ V.A.G workshop equipment catalogue .

Note

- *This air conditioner service station comprises the following standard components: Charging cylinder, pressure gauge set, vacuum pump, shut-off valves and filler hoses.*
- *One quick-release coupling each (for service connections on high and low-pressure end) is included in the scope of delivery of this air conditioner service station.*
- *Depending on the version, a current vacuum display (LED) may appear after pressing the „Evacuation“ button again.*

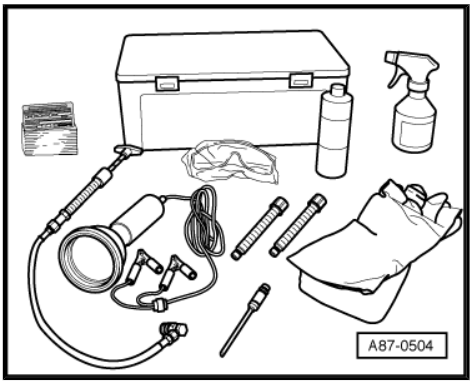
Leak detector V.A.G 1796



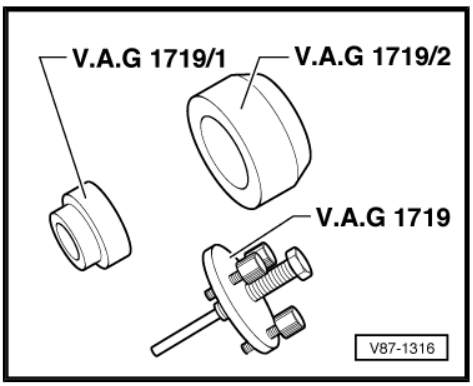
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Leak detection system VAS 6201



Puller for magnetic clutch V.A.G 1719 (for „Zexel / Valeo“ air conditioner compressor)



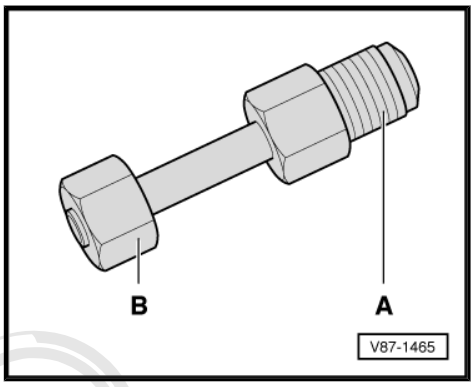
Adapter set for refrigerant circuit R134a V.A.G 1785/1-10

Adapter for cleaning refrigerant circuit (flush with refrigerant R134a) ⇒ page 115 or blow out with compressed air and nitrogen ⇒ page 106 .

A - 5/8"-18 UNF thread for conical seal

B - Union nut (for connection with O-ring) with thread

- M 18x1.5 V.A.G 1785/1
- M 20x1.5 V.A.G 1785/2
- M 24x1.5 V.A.G 1785/3
- M 28x1.5 V.A.G 1785/4

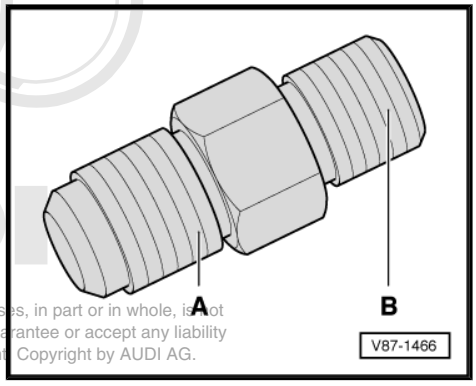


Adapter

A - 5/8"-18 UNF thread for conical seal

B - Threaded connection for O-ring

- M 18 x 1.5 V.A.G 1785/5
- M 20 x 1.5 V.A.G 1785/6
- M 24 x 1.5 V.A.G 1785/7
- M 28 x 1.5 V.A.G 1785/8



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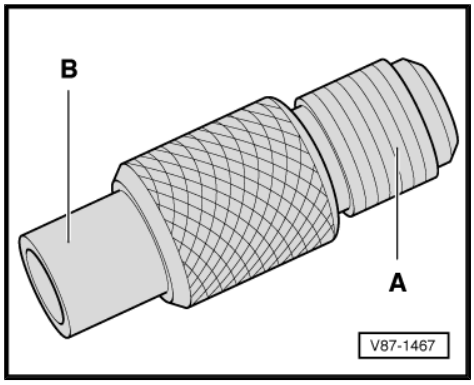
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Valve adapter

A - 5/8"-18 UNF thread for conical seal

B - Internal thread with valve opener

- M 10 x 1.25 V.A.G 1785/9 (for connections with valve on high-pressure end)
- M 12 x 1.5 V.A.G 1785/10 (for connections on low-pressure end)



Note

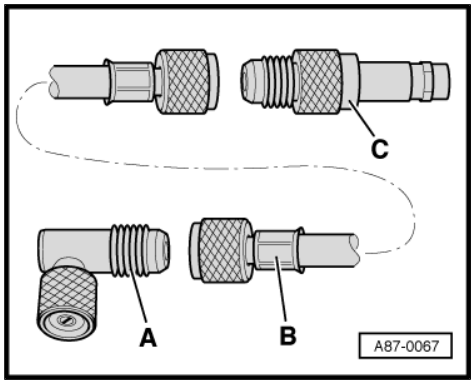
- *A Schrader valve is screwed into connection -A-.*
- *A valve opener must be installed in the charging hose connection.*
- *Various adapters from this adapter set are also included in the adapter set for refrigerant circuits -VAS 6338/1- .*

Adapter set for service connection V.A.G 1786

A - Adapter with union nut -V.A.G 1786/1- (only for connections with small valve core at low-pressure side)

B - Charging hose with union nut 5/8"-18 UNF(short version)

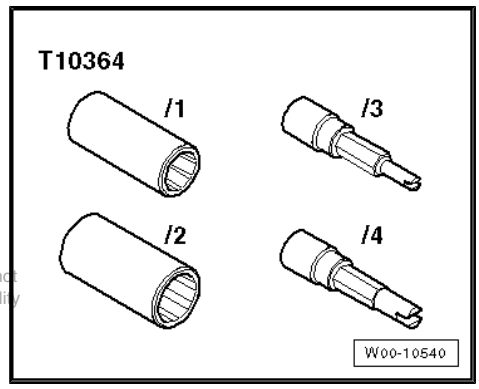
C - Adapter with service connection -V.A.G 1786/2-



Note

- *For connections with a large valve core (standard on „Zexel / Valeo“ compressors, gradual change to small valve core as of 10.94), use is to be made of adapter V.A.G 1785/10 (remove valve from adapter V.A.G 1785/10 or install valve opener in charging hose -B-).*
- *The logo of the compressor manufacturer „Zexel“ attached to the air conditioner compressor was modified from „Zexel“ to „Valeo“ from year of production 2006 onwards (change in manufacturer's name).*

Socket -T10364-



Note

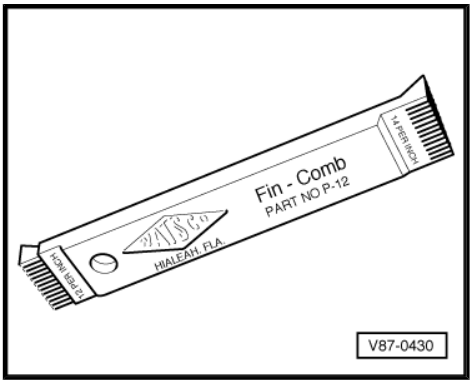
For removing and installing service connections and valve cores with refrigerant circuit discharged.

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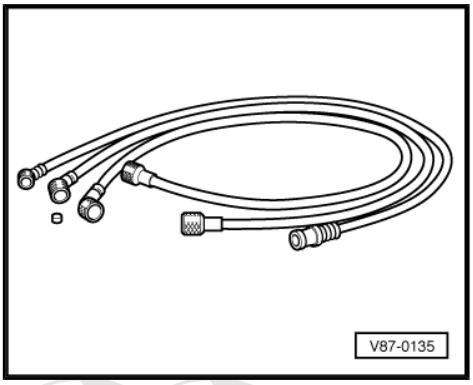
11.3 Commercially available tools and materials

Fin comb



Charging hoses

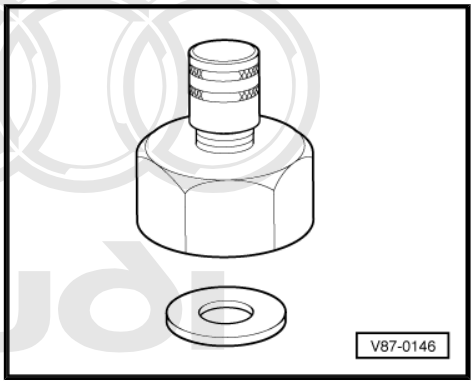
5/8"-18 UNF thread



Note

- *Use differently coloured charging hoses (1800 mm long).*
- *Have valve opener and spare seals to hand.*
- *A short filler hose is also included in the adapter set for refrigerant circuits -VAS 6338/1- .*

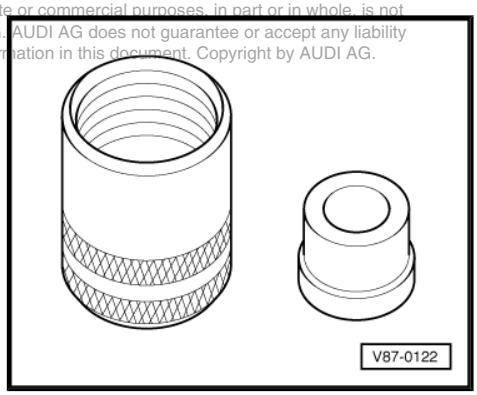
Connection piece for refrigerant cylinder with seal, quick-release coupling connection or threaded connection 5/8" - 18 UNF



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Valve caps with spare seals (for 5/8"-18 UNF thread)

Seals can also be used for charging hoses.

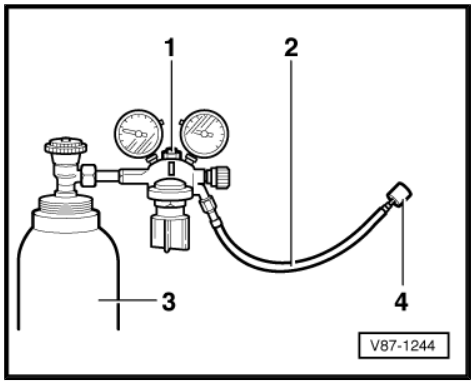


Note

Valve caps with replacement seals are also included in the adapter set for refrigerant circuits -VAS 6338/1- .

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Pressure gauge set with nitrogen pressure reducer (max. reducing pressure: 15 bar).



1 - Pressure gauge set

2 - Pressure hose (ID 5 mm, length 2 m)

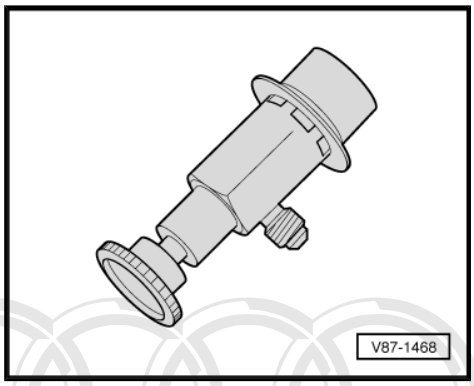
3 - Nitrogen

4 - Hose fitting

Note

For connection to adapter V.A.G 1785 with 5/8"-18 UNF thread

Quick-release coupling adapter for service connections



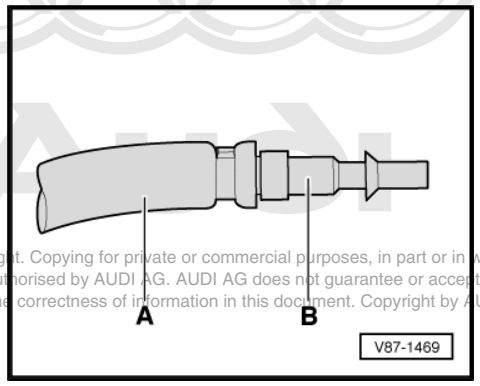
- High-pressure end, nominal size 16 mm
- Low-pressure end, nominal size 13 mm
- Sharan, 2 releasing tools

Note

This quick-release coupling is included in the scope of delivery of the air conditioner service station.

11.4 Improvised tools

Filler hose with connection to compressed-air system for workshop



A - Filler hose 5/8" - 18 UNF** (version with large ID)

B - Connection for workshop compressed-air system ** (always use filter)

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